FINAL REPORT

STRUCTURAL INVESTIGATION

1845 - 1902 CAPITOL BUILDING

TALLAHASSEE, FLORIDA

3 MAY 1978

FINAL REPORT

STRUCTURAL INVESTIGATION

1845 - 1902 CAPITOL BUILDING

TALLAHASSEE, FLORIDA

3 MAY 1978

PREPARED BY WILLIAM M. BISHOP

CONSULTING ENGINEERS, INC.

IN ASSOCIATION WITH

ARDAMAN AND ASSOCIATES, INC.

and

WILLIAM M. BALDWIN, P.E.

CONSULTING ENGINEER

William M. Bishop

Consulting Engineers, Inc.

TELEPHONE 222-0334
P. O. BOX 3407

317 EAST VIRGINIA STREET
TALLAHASSEE, FLORIDA 32303

3 May 1978

Senator Phil Lewis
Chairman
Joint Legislative Management
Committee
Capitol Building
Tallahassee, Florida

Dear Senator Lewis:

We are pleased to submit herewith ten (10) copies of the "Final Report - Structural Investigation - 1845-1902 Capitol Building."

The final report incorporates the Preliminary Report supplemented with additional information, an analysis of the findings, recommendations and special considerations.

Mr. Gomer Kraus, selected by the Secretary of State to work with us, was unable to make the time commitment and a copy of his resignation follows this submittal letter in the report.

Mr. Curry Powell of Jack Culpepper Contractors has commenced the preparation of cost estimates to accomplish the recommendations. Those will be submitted within fifteen (15) days of this report (18 May 78).

This report is a consensus opinion of the investigative team and is as factual as it can be in the time element allowed for the investigation.

Very truly yours,

WILLIAM M. BISHOP CONSULTING ENGINEERS, INC.

William M Bishop

William M. Bishop, P.E.

WMB/mmc

GOMER E. KRAUS & ASSOCIATES, INC.
Consulting Structural Engineers
4401 EMERSON STREET
JACKSONVILLE, FLORIDA 32207

April 25, 1978

Mr. William M. Bishop, President
William M. Bishop, Consulting Engineers, Inc.
317 East Virginia Street
Tallahassee, Florida 32303

Re: Florida's Historic Capitol
Tallahassee, Florida

Dear Billy:

I regret very much having to decline continued participation as a member of the team investigating Florida's Historic Capitol Building. I was not fully aware, when I agreed to participate in this project, that the time available to me was so short. When I was made fully aware of this urgency, it was obvious that I was entering the picture too late to properly prepare myself for the very important decisions which must be made. It also became apparent that it would require a lot of time for you and your staff to bring me up to date on your findings. I felt that your time and effort could be put to much better use in moving forward with your investigation.

I want to assure you and any other interested parties that my sole reason for declining further participation is the time element. I feel you and your staff are doing an excellent job in the time alloted to you.

I have no idea what your final recommendation will be, but am sure that it will be fair and impartial and in the best interests of all.

I am disappointed that our first attempt at working together on a project has turned out this way, but hope that we can work together in some manner in the future.

Sincerely,

Gomer E. Kraus

Gomer E. Kraus, P.E.

GEK/pk

C/ Mr. Rodney Little
Historic Preservationist

TABLE OF CONTENTS

		PAGE
I	General Construction Sequence	1 - 2
II	Scope of Investigation	3
III	Investigative Team	4
IV	Building Structural System and Materials	5 - 8
V	Method of Investigation	9 - 10
VI	Result of Investigation	11 - 15
VII	Additional Investigation After Preliminary Report	16 - 17
VIII	Analysis of Investigative Results	18 - 22
IX	Recommendations	23 - 27
	Figures	
	(1) 1845 First Floor	28
	(2) Photograph of 1845 Building	29
	(3) Photograph of 1902 Building	30
	(4) Structural Framing First Floor	31
	(5) Structural Framing Second Floor	32
	(6) Key Plan For Structural Inspection Photograph Locations Roof Framing	33
	(7) Section Through North Wing	34
	(8) Key Plan For Structural Inspection I Basement	35
	(9) Key Plan For Structural Inspection II First Floor	36
	(10) Key Plan For Structural Inspection of III Second Floor Plan	37

TABLE OF CONTENTS (CONTINUED)

PAGE

Figures

(11) Key Plan For Structural Inspection 1902 Second Floor (Ardaman's Attachment) 38

(12) Key Plan For Structural Inspection First Floor (Ardaman's Attachment) 39

(13) Key Plan For Structural Inspection 1902 Basement Floor (Ardaman's Attachment) 40

(14) East West Section (Looking South) 41

(15) West Truss, Plan of Top of Second Floor (Ceiling in Dome) 42

(16) Southwest 1845 Fireplace in Center Section 43

(17) Typical Footing and Wall Elevation 44

(18) Section A-A and Section B-B 45

Attachments:

Ardaman Preliminary Report	26 pages
Investigative Notes	6 pages
William M. Baldwin Notes	4 pages
Continuing Research	1 page

I General Construction Sequence

The masonry contract for construction of the present Capitol Building of Florida was signed 12 November 1839 between the State of Florida and R. A. Shine. The original structure was to be 150 feet 5 inches long and 52 feet 5 inches wide. All structural materials were of brick and heart pine timber. In the historical analysis prepared by Mr. Herschel E. Sheppard AIA in the report "Conservation Alternatives Existing Capitol Building, Florida Capitol Complex" submitted in Januray 1977 by Edward Durell Stone and Reynolds, Smith and Hills, Associated Architects, Engineers and Planners an excellent review of the construction sequence is presented for the 1845 and 1902 structure. Figure 1 is the plan of the first floor of that structure. Figure 2 is a xerox copy of a photograph of that building. At that time the ground floor occupied about 7900 $ft.^2$.

In 1902 ground floor area was approximately doubled when a wing was added to the north and south ends of the 1845 structure. These wings were symmetrical each being about 69 feet in the east-west direction and 50 feet in the north-south direction, totaling 6900 $ft.^2$ at the ground floor. Figure 3 is a xerox copy of a photograph of the building at completion of this addition.

Construction materials were the same as those in the 1845 structure except that concrete foundations were used instead of the corbeled brick used in the original building.

Some steel columns and beams were used in the long span over the existing meeting halls in the 1902 structure.

However, in 1902 a dome was constructed over the center section of the 1845 structure. This was framed with timber structures and was carried on two

trusses to chimney sections used for bearing pilasters in the original brick masonry walls.

At that time or shortly thereafter, some type of false dome was exposed in the second floor ceiling. It is also suspected that an opening existed through the second floor for exposure from the first floor.

In 1923 extensive re-modeling was done along with additions to the east and west making a cross of the floor plan. Most of the renovations to the center section was done at that time. In 1937 and 1947 major expansions were attached to the ends of the north and the south wings. The '37 and '47 expansions are not addressed in this preliminary report nor will they be reviewed in the final report. The '23 addition was reviewed only to the extent that it affected the 1902 and 1845 structures.

II Scope of Investigation

The scope of the structural survey was restricted to the "center section" of the building only. However, since the 1902 expansion and renovation was intergrated to a large extent into the 1845 building preliminary investigations were also done on the '02 structure.

The investigation was to be a complete study of the structural integrity of the building from foundations through the dome and a report was to be written of the structural soundness of the building.

In addition tentative recommendations were to be proposed for corrections to make the building structurally sound. No proposed usage of the building was specified therefore a conference of the professionals made the decision that all floors should be adequate to support a 100 pound per square foot (psf) superimposed live load in addition to partition and other dead loads.

The report was to be prepared in three phases. The first was to be completed in three weeks (by Monday 24 April 1978) and would be preliminary structural findings of the general condition of the building. The second report of final structural soundness was to be completed nine days (1 May 1978) after the first and was to recommend suggested remedial action. The third phase was to be very tentative cost estimates based on the recommended action but was to be prepared without having plans for the renovations. It was recognized and accepted that this estimate could probably be not more than 30% accurate. No time schedule was established for these cost estimates. They therefore will be based on first quarter, 1978 prices. Future uses of the estimates should be escalated to reflect escalation of costs. The third phase of the report was requested to be completed forty-five days from the beginning date of the report. (15 May 78).

III Investigative Team

To insure a complete and credible report it was decided to bring two outside firms in as consultants to work with William M. Bishop Consulting Engineers, Inc. After approximately one-half of the preliminary study time had elapsed, the Secretary of State suggested that a third consulting firm be engaged to provide another viewpoint to the investigation and this was done. Two of the firms were represented by their principals and were consulting structural engineers. The other firm engaged was a testing firm and they too were represented on the project by a registered professional engineer.

In addition to the engineering firms we also engaged a local contractor to work with us. He was to provide openings in ceilings and floors where required and we selected a contractor who had operated in Tallahassee for many years and who was familiar with the structural system of the capitol.

These firms and the principals actively participating in the project were:

(1) William M. Bishop, P.E. Florida Registration 4558

(2) Martin Page - registered P.E. in New York No. 48169

(3) Larry Cobb P.L.S. Florida Registration No. 2470

(4) William Baldwin P.E. Florida Registration No. 7805

(5) William Miley P.E. Florida Registration No. 6677

(6) Don Carraway - Manager Ardaman and Associates

(7) C. A. Cooksey - Superintendent - Jack Culpepper Contractor

In addition to the above, William M. Bishop Consulting Engineers, Inc., had one to three additional draftsman and Ardaman and Associates had one to two field technicians working on the project.

IV Building Structural System and Materials

A - General

Figures 4, 5, 6 and 7 are included to indicate direction of framing, main structural members etc., but are not to be construed as as-built plans of the building. In an existing building of this age and size it is not only not practical to expose each section but it is almost impossible. These sketches do indicate however the general scheme of the framing details as closely as is possible at this time. They are adequate for this purpose.

B - Foundations and Walls

Exterior walls of the 1845 building are all brick bearing walls. The foundation is brick and is seven bricks (4'-8" ±) wide at the bottom. From seven bricks it tapers to three bricks (24") wide at basement floor level. The basement floor level exterior wall remains three bricks (24") thick to the first floor level where it reduces to 2½ bricks (20"). It remains at 20" to the second floor level where it reduces to 2 bricks (16") and then is of constant thickness to the roof line. See figure 7.

The 1902 addition continued the identical wall sections, basement to roof, except that non-reinforced concrete was used for the foundations in lieu of the corbeled brick.

C - Basement Floor

The existing basement floor was opened at selected locations to inspect the foundations. In the 1845 basement floor evidently a brick floor was installed. In the period since that installation and at some unknown time the brick was covered by a thin coat of mortar. Three inches of sand clay was placed over that and approximately a 2½" concrete terrazzo floor was installed.

Apparently at some future date cracks must have become excessive in the terrazzo because a 4½" concrete deck was poured over the terrazzo.

All major bearing walls penetrated the concrete floor but partition walls over a period of time have been placed bearing directly on the concrete slab.

The 1902 floor is concrete on grade.

D - First and Second Floor Framing

In the floor framing plan Section the center section of the building will be omitted as it will be covered under Section G with the dome.

The floor is framed with heart pine 3x12's and 3x14's full cut. The north wing of the 1845 building and the first bay in the south wing adjacent to the center section is framed in an east-west direction with 3x12's @ 16" spanning from the exterior walls to the interior corridor bearing walls. Walls are continuous through and the joists rest in wall pockets with fire cuts on their ends.

The last bay of the 1845 building is framed from the south exterior wall to the first east-west interior wall which is a bearing wall with 3x14's @ 16" O.C. End conditions are the same as the remainder of the joists.

The 1902 building addition continued the 3x14 joists @ 16" O.C. spanning in a north-south direction. However two steel beams supported by steel columns span in an east-west direction to reduce the span of the joists.

Figures 4 and 5 show the framing on the first and second floors.

E - Roof Framing

Figures 6 and 7 show roof framing. The cross section in figure 7 is through the 1845 wing section where the trusses span east-west at 11'-6" O.C. Rafters

(2x6) @ 27" O.C. span in the same direction and are supported by two 4x8 purlins resting on the top chord of the trusses.

As shown in figure 6, roof trusses in the 1902 section span in a north-south direction spaced at approximately 13'-6" O.C. The two roofs valley from the point where the peaks meet.

F - Center Section and Dome Framing

The 1923 remodeling removed stairs from the center section of the capitol lobby and extensive, if not complete, reframing occurred. Four columns extend from the basement through from the basement to the second floor framing. Prior to the 1923 remodeling these columns extended through to carry roof and dome loads. In '23 these columns were removed and the loads carried by them were transferred to the trusses supporting the dome. No evidence is available that shows the trusses were reinforced.

The 1845 and 1902 plans indicated stairs in the center section from the basement to the second floor. These stairs were moved into the 1923 addition and the openings were reframed and closed. The framing in the center section is now carried on the original interior bearing walls running east and west and steel beams running east and west and supported on the columns. The joists are 3x12 heart pine joists @ 16" O.C.

The dome is carried on four timber trusses. The two principal trusses span north-south and are supported on chimneys in the north and south interior bearing walls. These chimneys served fireplaces on each of the basement, first and second floors. Corings showed that the flues were not filled although the fireplaces were bricked in.

The trusses on the north and south are supported by the two principal trusses on the east and west sides. All loads are transferred to the chimneys.

Figure 15 shows this framing.

The recessed roof section in the center of the dome frame apparently supported a false dome in the 1902 building. It was replaced by a recessed decorative ceiling. This framing is supported by two trussed beams spanning east and west to the two principal trusses on the east and west. This load is also transferred to the chimneys. Figure 15.

The dome frames on the top chords of the four trusses with vertical 2x8 studs continuous to just above the roof level. Four trusses, each parallel to its companion truss, carry a second stud wall to the same level. The outside of the second stud wall is sheeted with wood sheathing and covered with formed galvanized metal shaped to resemble stone. The interior wall is sheeted with wood sheathing for stability.

The outside wall stops at this point and the interior wall continues vertically to a second level. Though this rise the wall contains three windows on each of the four sides.

At the top of this level the studs are framed to carry the dome itself. The dome is framed by inclined wood studs. It is shaped by kickers from the studs supporting shaped members which provide the curved shape. Wood sheathing forms the base to which the sheet metal finish material is attached. Figure 14.

Framed to the top of the dome is the cupola which is also wood frame. The cupola is covered with sheet metal.

V Method of Investigation

Due to the short time element involved in the investigation, three teams commenced work in the capitol building.

The first group effort commenced in the basement, where holes were cut in the concrete floor at strategic spots and the foundations and lower sections of bearing walls, both exterior and interior were exposed for examination and measurements. Sample bricks and mortar were removed to test compressive stresses in the testing lab. Core borings were made in the walls at selected points to check the condition of the brick masonry and to verify thickness and stability.

At the same time a second group effort commenced examination of roof and dome structures particularly of the timber members in trusses. Every truss in the attic space was examined to detect damage from rotting or termites and signs of excessive stresses.

The group commencing in the basement worked from the basement up and principally investigated structural masonry units. The group in the attic worked down to the basement principally investigating timber framing.

A third group began a framing plan to determine the major load carrying members in masonry, timber and some rare steel members. The loads were traced to vertical supports and on to the foundation. Columns and pilasters were exposed and cored to determine depths, stability and any other significant features or defects.

As the framing plans progressed and conditions were exposed at strategic or suspect locations on beams and joists to detect crushing in bearing, rot, rotation or other defects if present. Where the members were in good condition these were noted as being so.

Three group meetings were held lasting from an hour to half a day to compare

notes and devise continued strategy.

No field load tests were made nor were any soil investigations made. The load tests were not considered to be practical and since the building showed no excessive settlement, soil investigations were not thought to be necessary.

The fire marshal was contacted for his input. His comments will be made a part of the final report when they are made but are not ready as a part of the preliminary report.

In addition to the field investigations of the building, Mr. Baldwin contacted Mr. John Gamble, P.E. who worked on the 1936 construction and gained some valuable insight on the construction methods used at that time.

Figures 11, 12, and 13 show the location of cores and openings for investigation preformed by the testing lab principally in the inspection of masonary sections. This is keyed to the Ardaman Report.

Figures 6, 8 and 9 show openings, inspections, and locations of framing and timber photographs and inspections and key numbers refer to those notes.

VI Results of Investigation

A - Foundations and Walls

In general the foundations and walls were built according to specifications. The bricks tested in the lab showed no consistency in the results of the compressive testing. As an overall average they probably would run about 1000 psi as compared to brick today of about 3000 psi. The samples tested however ran from as low as 268 psi to as high as 2075 psi (see page 6 - Ardaman's Report). Location in the wall apparently had little effect on strength. Brick in the foundation varied from 296 psi low to as high as 2075. However, the brick in the basement wall tested lowest of all those tested.

The walls were relatively free of cracks. Little sign of wall settlement was visible in this preliminary study.

Mortar samples (page 7 - Ardaman Report) tested at much lower strengths. The test reports varied from a low of 48 psi in one sample taken from the Northeast chimney supporting the major dome trusses to 268 psi for another mortar sample taken from the same area. The average of the samples, omitting the highest and lowest results, was 120 psi. By far the weakest element in the bearing walls is therefore the mortar. Todays mortar will test out about 1800 psi (average) for below grade and 750 psi for above grade construction.

B - Basement Floor

The slab floor in the basement although being full of ridges and low spots had no major settlement cracks. A level was used to determine spot levels throughout the basement floor. Elevations varied widely. This would tend to indicate that the difference was caused by the method in which the concrete slab was poured, rather than in settlement.

Several openings were made in the basement ceiling to inspect the framing of the first floor. Since these conditions reflect the soundness of the first floor framing they are discussed in the section under that title.

C - First Floor Framing

In inspecting floor and wall framing it must be recognized that it is not practical to remove entire ceilings or wall coverings to check every element. Inspections are therefore general in nature and final renovations are always more extensive than originally expected.

The framing for the first floor was found to be in generally good condition. Joists were generally sound and free from rot and termite damage. At point C-8 (see Basement Plan, Figure 8) the frame wall running east and west showed evidence of termite damage. The joists however appeared to be sound. This does not mean that damage will not be present somewhere close by but at the point of the opening they were not damaged. At point C-5 (same figure) a brick arch spanning the corridor was cut deeply from the bottom to allow pipe to be recessed. There is no explanation as to why the arch is still intact but nonetheless it is.

Elevations were taken along the center of the corridors and against the exterior walls to determine if settlement or sag in the joist were occurring.

As would be expected the principal deflection shows at the center of the open area in the center section where elevations show ½" to 1" deflection from exterior walls to the center of the floor.

D - Second Floor Framing

Figure 10 shows where openings were made in the floor to inspect and

examine the framing system for the second floor. The numbers are keyed to the inspection sheets attached to this report.

The second floor framing is similar to that shown for the first floor. The joists are generally in good condition with little rot or termite damage. Again we point out that these conditions exist at the points we examined and that a few feet away conditions of termite or rot may exist. However, the points inspected were selected to be typical of the floor framing conditions.

Plaster is spalling from the wall in two or three spots. This indicates the presence of water and the possibility for future damage.

The elevations shot by level show a high of 99.57 at the exterior wall of the 1845 building adjacent to the 1902 addition on the northeast corner. At the south end of the north-south corridor adjacent to the 1902 structure an elevation of 99.0 was shown (these are relative elevations, not true datum!) indicating about 7" difference in the two points. The change is uniform however and does not occur suddenly. Strangely this difference is prevalent only at the second floor to this degree. On the first floor level the same relative elevations are 99.11 and 98.98 (about 1½ inches). The basement floor is 99.88 and 99.90 (relatively level).

E - Roof and Dome Framing

Figure 6 and the numbers located thereon relate to the notes attached to this report to indicate the location of various inspections. The inspection of the dome is also keyed to Figure 6.

Few of the trusses in the roof are without damage or deflection ranging from almost complete deterioration to shifting of loading, reversing stresses or increasing stresses.

The initial signs of damage in the roof and dome section were extensive enough that it was decided to make a member by member inspection of all major roof and dome structural members. The roof was inspected and defects were noted at thirty-eight different locations.

In the north wing of the 1845 building the trusses had inclined to the north. The inclination was checked by dropping a plumb bob from the top chord and measuring to the bottom chord to determine the amount it was leaning. This measured two inches.

Air handling units have been placed in each wing adding loads directly to the bottom chords of the trusses. In addition to this load most areas now have approximately three ceilings supported from ceiling rafters. Mezzanine floors have been added most of which are supported from the second floor. However, stairs for access to these floors have been supported by rods hanging from roof rafters.

Termite and rot damage is extensive though a great deal of repair work has been done over the years. The notes attached hereto give the results of the investigation at each point indicated on the key map.

The dome is supported by four trusses but two of the trusses frame into the two trusses on the east and west which span north-south.

The western truss has 5-2x14 members bolted together to form the bottom chord. One of these 2x14's is completely destroyed as a structural member. The 2x14 adjacent to this one has been extensively damaged on the north end. The bottom chord is not easily accessible along its entire length but as best we could determine the deflection in the bottom chord is about 4½". The compressive members in the truss are not in contact with the bottom chord and are taking no load. This loading has been transferred to other members of the truss. Conservatively the bottom chord has been reduced to about 60% of

its original strength.

The vertical members of the dome from the truss top to the curved dome (Zone B - Figure 14) at first inspection appeared to be relatively sound but the more detailed inspection showed extensive rot where the members were exposed to the leaks near the metal covering. This condition is prevalent throughout the dome section.

The cupola is in extremely poor shape and probably shows more rot than any other section.

The preliminary study in its very late stage indicated that the dome is out of plumb and leaning slightly to the north. The inclined trusses in the north wing of the 1845 attic give credence to that and it will be studied more in detail prior to the completion of the final structural report.

VII Additional Investigation After Preliminary Report

A - Dome Out of Plumb

It was impossible to find a location where the amount of inclination of the entire tower could be measured with any degree of accuracy.

On the interior it was measured(by dropping a plumb line) over a twelve (12) foot distance as three (3) inches to the north. Some of this could have been built into the structure at the time of construction however this would have been unlikely. The trusses in the north wing which show a similar inclination verify the fact that the dome has commenced this since construction was completed.

B - Chimney Support for Dome Trusses

The borings taken on the chimney above the second floor verify that three flues are present in that area as was suspected. Figure 16 illustrates this configuration. The four (4) inch sections are not capable of carrying any loading reducing the effective bearing area to two (2) sections. One 13"x24" and one 10"x24".

C - Fire Marshall and Building Inspector

Mr. Larry Cobb of our office met with Mr. Robert Johnson of the State Fire Marshal's Office. Mr. Johnson pointed out that his office regulates the enforcement of the Life Safety Code. The area of this code's enforcement on the renovation of the old capitol building would principally concern stairs and stairways and their construction and location.

He stated that the stairs must be encased with fire proof construction and they must exit to the exterior. He did not comment on the member of stairs required for this building nor did we pursue this as it is considered by us to be an architectural treatment. It should be noted however that they will be required.

Mr. Roy Mayo, City Building Inspector, was consulted regarding fire requirements for the downtown area of Tallahassee. Although it is our understanding that the state does not have to conform to local codes, they make it a practice to do so. Mr. Mayo pointed out that to conform to local codes the underside and the top of the wood framing on the first and second floor must have a one hour fire rating. The method of obtaining this is a structural consideration as it will add load to the existing members.

Also dead end corridors may not exceed twenty (20) feet. This requirement necessitates exits at each end of the building. Although this would be an architectural consideration it should be considered at this time.

VIII Analysis of Investigative Results

A - General

The findings outlined and enumerated in Sections VI and VII of the Preliminary Report have been reviewed by the investigative team and have been evaluated to determine their meaning in the overall structural integrity of the building. The conclusions reached in these reviews are the consensus of the team and represent the team analysis.

The order of the analysis presentation in this report approximately represents the magnitude of the component's relationship to the severity of the total structural integrity.

B - Dome Section and Roof Framing

The most severe and immediate problem in the old capitol builing is the dome and its supporting framing.

Vertical members supporting the dome section have been exposed to wetting and drying from a leaking roof for years. These members now show deterioration from this abuse at their ends where most of them are beginning to rot and many of them have no bearing value at all.

The main trusses supporting the dome framing and consequently the dome are the east and west trusses (span north-south). Of these two the west truss has lost at least 50% of its strength due to termite damage, stress reversals and deformation. The top and bottom chords are taking the stresses that normally would be carried by the diagonal compressive members. In addition, 40% of the cross sectional area of the bottom chord will no longer have any significant load carrying capability.

The bearing area on the north end of the truss has also been reduced and is showing signs of crushing.

This particular truss has deteriorated to the point where it is in danger of collapse. Recommendations will be made in the next section for shoring to support this truss.

The east truss is somewhat better but probably if viewed by itself without having the other truss as a comparison would be causing many concerns of its own. Termites have caused damage at the bearing on its north end. The diagonal members are not carrying any load. A trussed beam is carried on the bottom chord near its quarter point. The trussed beam is twisting at its support and shows 2½" to 3" of deflection. The bottom chord of the east truss shows a deflection of 0.21 ft. (2½").

The roof framing to either side of the center section is only in slightly better condition. Quite a bit of repair work has been done over the years in these areas. A good large part of this amounted to shoring, deck replacement and scabbing added sections to existing members.

Shoring and kickers are used to divert the load from a defective member to other structural members. This is effective as a permanent solution only when the member to which the load is being transferred is capable of accepting the additional load.

Scabbing is a method of attaching another member to the side of a defective member to reinforce the damaged original member. This is effective as a permanent solution only as long as the method of attachment is capable of transferring the load. In many cases, the rotted member continues to deteriorate and the nails, bolts or other means of transferring the load will fail.

Replacing damaged roof deck with new decking is generally effective and permanent.

A total of seventeen (17) trusses support the roof structure. Fourteen (14) of these trusses showed some defects.

The trusses north of the dome all lean to the north. The dome itself leans to the north. This was measured to be three (3) inches in twelve (12) feet. The trusses inclined two and one-half (2½) inches in the same direction. The struts between the two walls supporting the dome to just above the roof section are stressed in compression and show the bowing normally occurring in this type failure.

It is therefore our opinion that the entire roof and dome section over the 1845 and 1902 section must be removed and replaced. Any attempt to repair or renovate will be more costly than removing and replacing.

C - Foundation and Walls

Although the foundation and walls have relatively few settlement cracks, the low strength in the bricks and more particularly in the mortar means that the masonry has deteriorated to a point that they will require extensive strengthening to maintan a stable condition for any extended period of time. Reinforcing should extend from the foundation to the top of the wall. Reinforcing should be both vertical and horizontal.

The brick and mortar in the foundation will require confinement to continue to carry the loads they now carry. This must be applied to all bearing walls.

When the roof and dome are removed temporary support must be provided until permanent bracing can be installed. A moderate wind will overturn the wall in its present condition.

D - First and Second Floor Framing

In any renovation of the building all ceilings should be removed in the basement and the first floor at which time the floor framing can be exposed

and completely inspected for damage. Bearing areas, both the masonry bearing and the ends of the joists, should be checked.

Although our inspection did not uncover any serious defects, they are always suspect in an old building.

One other item which will require consideration in the first and second floor framing requirement was pointed out in the conference with the fire marshal and city building inspector. Present codes require a one hour fire rating both below and above the floor joists. Very likely, the method of providing this protection should be decided in architectural considerations for the renovation but the weight of the material used in fire proofing must be deducted from allowable live loads. Allowable live load calculations were not made a part of this report as all conditions of the joists were not known. The timber used in the framing for this building is more than 130 years old. It is not completely reasonable that the timber in the roof can be as seriously damaged by termites and rot and the timber in the first and second floor framing to be completely free of damage. However, preliminary calculations indicate that, assuming all joists and end bearing conditions are good, a reasonably light office load could be supported. The floors will not support library loads, storage loads or any other useage exceeding light office loads. Caution should be exercised in accepting the inspection as being conclusive in the soundness of the framing system.

E - Basement Floor

No structural defects were noted in the concrete basement slab; however, it is the top layer of at least three prior floors. The sections through the floor were not consistent throughout as was reported in the preliminary phase. In at least one section, the 2½" terrazzo floor was topped by a wooden floor.

At some future date, a concrete slab of 2½" to 3" was poured over that.

In the work required for the foundations, the floor will be penetrated continuously around the exterior bearing walls and the interior bearing wall. In the destruction of the floor for this work, the entire slab should be removed and re-poured.

IX Recommendations

A - Roof and Dome Section

In Section VIII it was determined that the roof and dome sections must be removed and replaced.

Extreme care must be used in the removal of the roof and dome. The structural framing and the walls are in poor condition, both to the extent of being dangerous. The roof framing structures are not anchored to the wall except by friction. In removing the structural system any blow to the wall could cause the entire wall above the second floor to collapse.

The first section to be removed must be the dome. The dome section is in failure prior to commencing demolition and the removal of any lateral support will almost certainly cause complete failure and collapse.

Once the dome is removed and prior to removing the roof the walls are going to have to be braced to secure against movement in either direction. They may collapse outward as well as to the inside.

The roof will be removed only after the walls are temporarily supported. In removing the roof framing lateral support must be provided to prevent toppling of the trusses. Friction of the end rafters tying to end walls and the nailed decking are the only forces to resist the toppling. Both are of doubtful value. Even with lateral supports in place, removal of the roof will be risky.

B - Foundations and Walls

The walls will require strengthening in both the horizontal and vertical directions. Many methods are available for this but we recommend that vertical pilasters be poured spaced to coincide with spacing of new roof trusses, but the spacing should not exceed about 12 feet. The wall should be pocketed to

allow the concrete to recess into the wall. The pour should be continuous from foundation to the top of the wall. The pilasters should be reinforced to resist both bending and column action.

Horizontal bracing should be poured between pilasters at approximately the floor levels and mid wall height for both the first and second floor levels. The basement level should be analyzed to determine the necessity for the horizontal beam at mid floor to ceiling height. That particular wall is 24 inches and may probably be adequate.

At the top of the wall a continuous concrete cap beam should be poured that will fix the top of the wall. Anchor bolt must be provided for roof framing anchorage. If it is desired to maintain present wall height the top bricks could be removed to compensate for the cap beam.

Bolts should extend through the outside wall with plates on the outside to be certain that the walls are supported against movement in either direction. The plates should be large enough to extend well beyond the pockets cut into the brick so that they will provide ample bearing.

Interior walls which are carrying floor framing and non-bearing partition masonry walls constructed of the same era brick and mortar should receive similar treatment.

Various methods were also investigated to stabilize and confine the brick foundations. It is recognized that many new epoxy materials are available for masonry sealing and bonding.

Most of these have had limited years of experience or track records. It is suspected that use of the better products will be as expensive as the tried and proven concrete encasement. It is therefore proposed that all existing brick foundations be encased in reinforced concrete as typified in Figure 17.

These designs are purely preliminary for estimating purposes only. Further design and planning will be essential prior to any renovation work. Note the concrete needles through the wall and beneath the footings to bind the concrete to the brick and to provide additional support.

The chimneys supporting the dome trusses must have the flues filled with a structural material to carry the new dome loads. Figure 16 shows a section through the chimney at the second floor. As can be seen very little masonry remains to support the truss loads at this level or at the first floor level. One flue commenced at the fireplace on the basement level, a second at the first floor fireplace and the third at the second floor level. Some argument could be made to fill only two but the chimney serves no purpose except as a structural column and it should therefore be made into a structural member. The outside of the chimney must be formed to prevent the pressure of the concrete from causing the four (4) inch brick to pop out.

C - First and Second Floor Framing

All ceilings should be removed from the basement and the first floor to thoroughly inspect all of the existing floor framing. Any defective joists should be removed and replaced with treated lumber. If masonry pockets indicate failure of the brick in bearing these areas must be cut out and patched with high strength mortar to provide adequate bearing surface. In most instances of pocket bearing and fire cut joists the joist itself rests directly on the masonry and it is suspected that these are constructed in that manner.

One item mentioned in the preliminary report that is unexplained is the difference of seven inches in elevation between the north end and south end of the second floor of the 1845 building. It is impossible to predict what difficulty this may cause in the renovation, but it does indicate something out of the normal and problems may arise from this.

D - Basement Floor

We recommend that the entire basement slab and the brick floor be removed and repoured.

E - Special Considerations

1 - Emergency Action on the Dome

The investigative team in its engineering analysis and review recognized that the dome is in a condition of near failure at this time.

The team does not want to be alarmists but the structural trusses supporting the dome are near failure. It is the opinion of the team that an unusually high wind originating in a thunder storm could cause collapse of this portion. We therefore recommend that supporting shoring members be extended from columns that terminate at the second floor level to the roof level and that from these column extensions the trusses be given temporary support. We suggest that this is an emergency situation and should be done at once.

2 - Temporary cover during roof replacement

At the time the roof is being removed and remains off a temporary shelter must be provided to keep rain from the interior of the building. Various methods have been suggested such as air supported plastic products but again we propose that temporary wooden trusses supported from interior and exterior walls be used with temporary roof decking and a rolled roof felt be used as the most positive means. It will have to be sectionalized for accessibility during the time that the walls are being ribbed for strength.

3 - Fire Marshall and Code Requirements

The fire marshal was contacted and visited the site with Mr. Larry Cobb. The fire marshal's office does not enforce building codes as related to fire ratings etc., but he does enforce the Life Safety Code requiring the closure of vertical openings including stairwells.

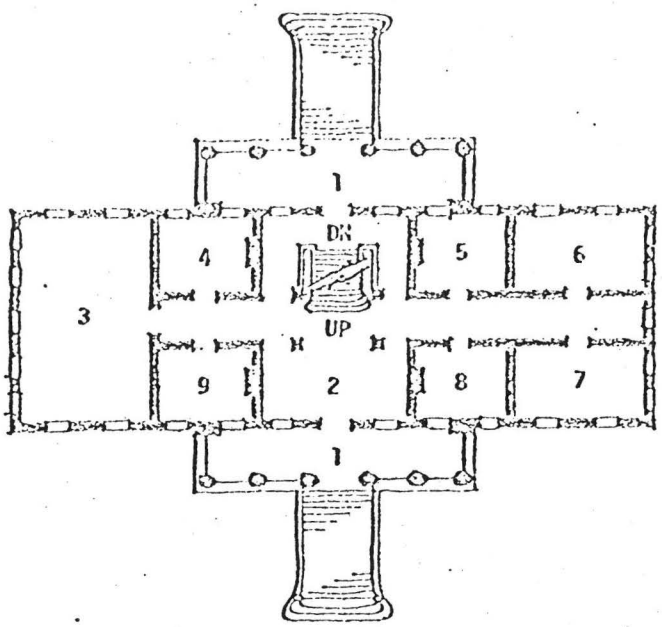
Although these requirements are not direct structural considerations

they do have considerable influence on the loads transmitted to structural frames. Under the present regulations the 1845-1902 structure could not accurately be duplicated. Stairwells must be enclosed in fireproof enclosures with fire doors. They cannot exit to the outside. The 1845-1902 stairwell would not comply at all with this requirement.

Addition stairwells must also be provided at each end of the building.

City building code requires 1 hour fire ratings on the floors both above and below the structural framing. This has been mentioned previously.

The final decisions on such items as these will be pesky but will be necessary before final structural renovation plans can be completely estimated.



1845 FIRST FLOOR

TENTATIVE FLOOR PLAN

1. PORTICO
2. LOBBY AND STAIR
3. SUPREME COURT
4. ATTORNEY GENERAL
5. TREASURER
6. GOVERNOR
7. SECRETARY OF STATE
8. COMPTROLLER
9. OFFICE

Figure 1

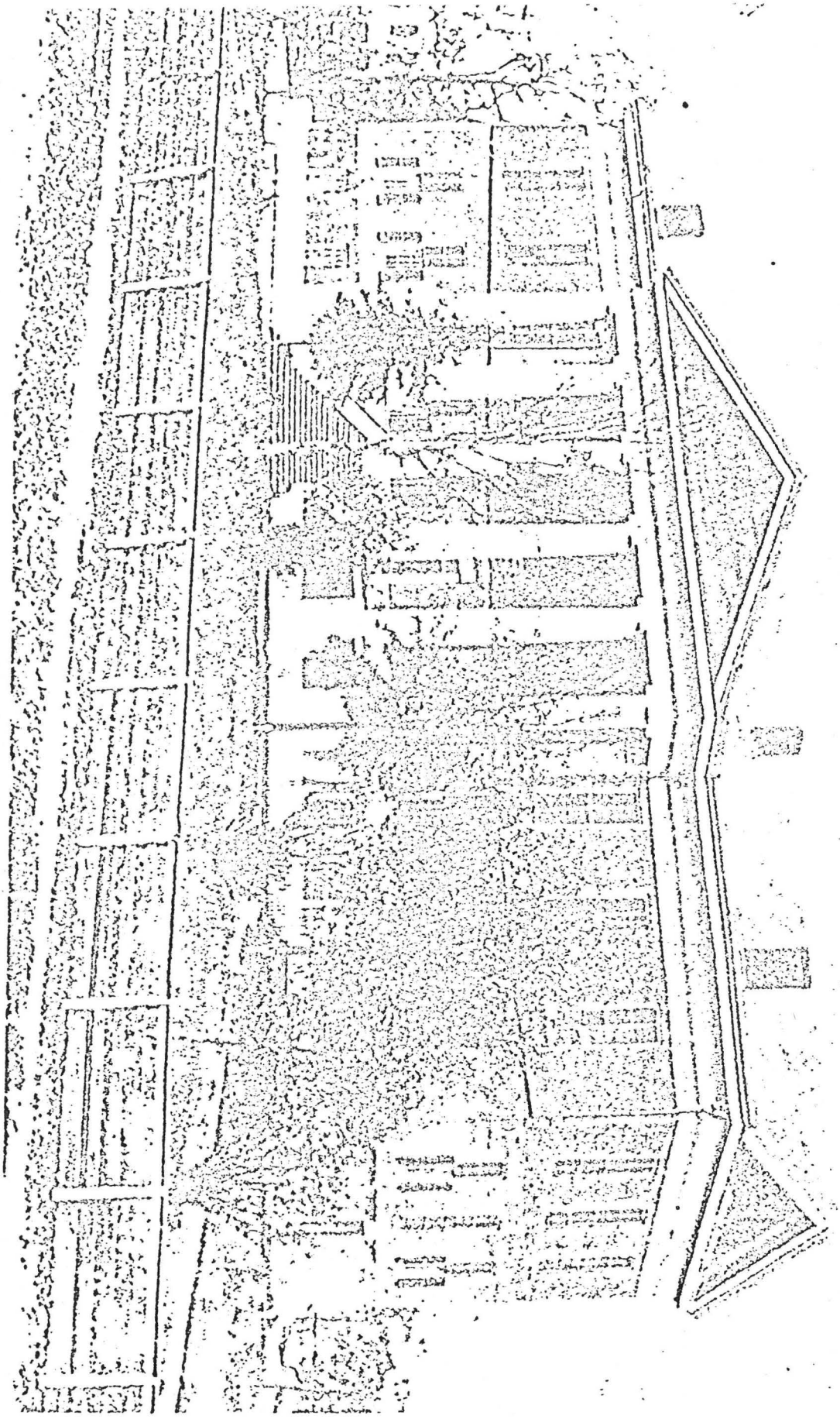


Figure 2

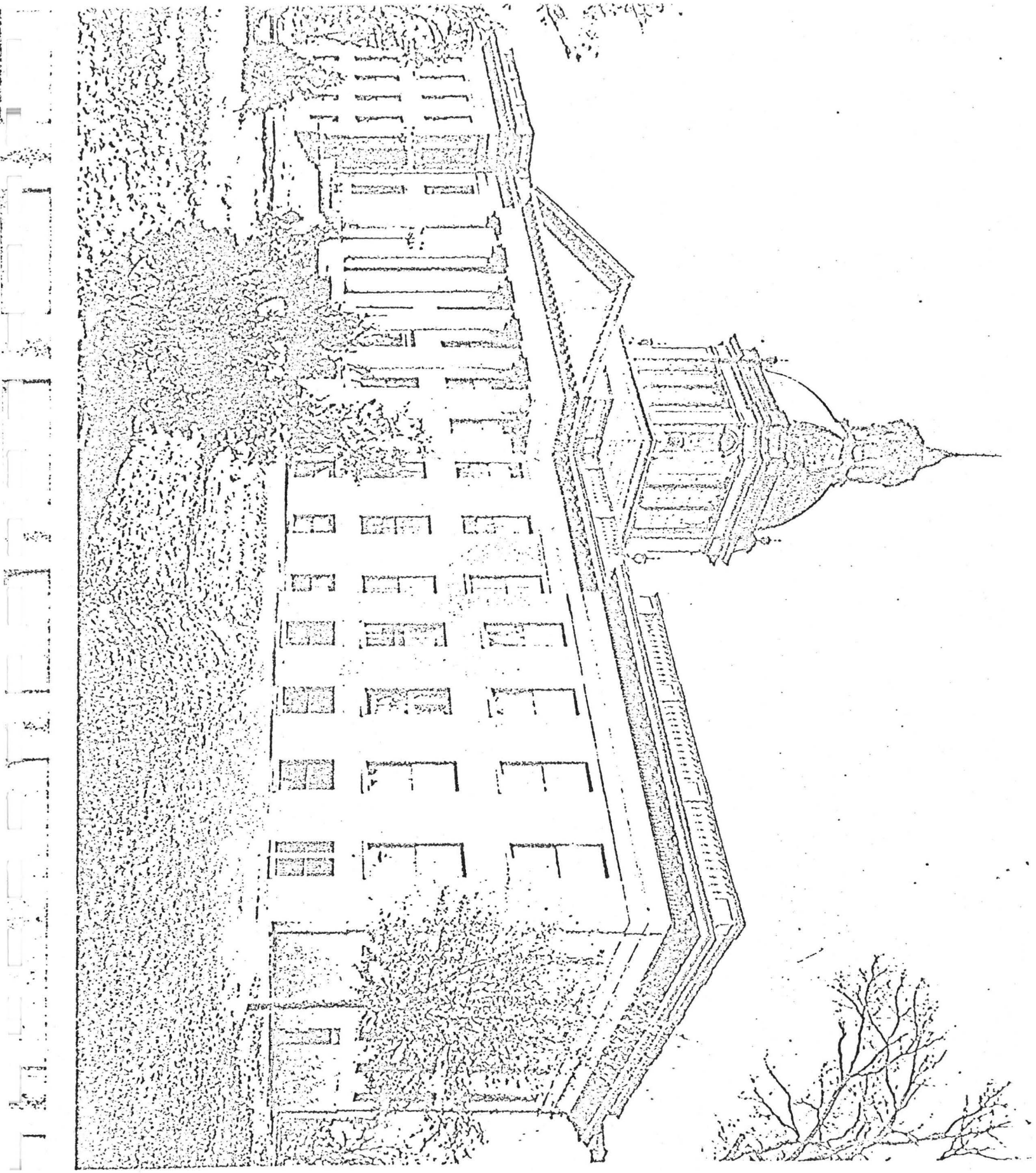
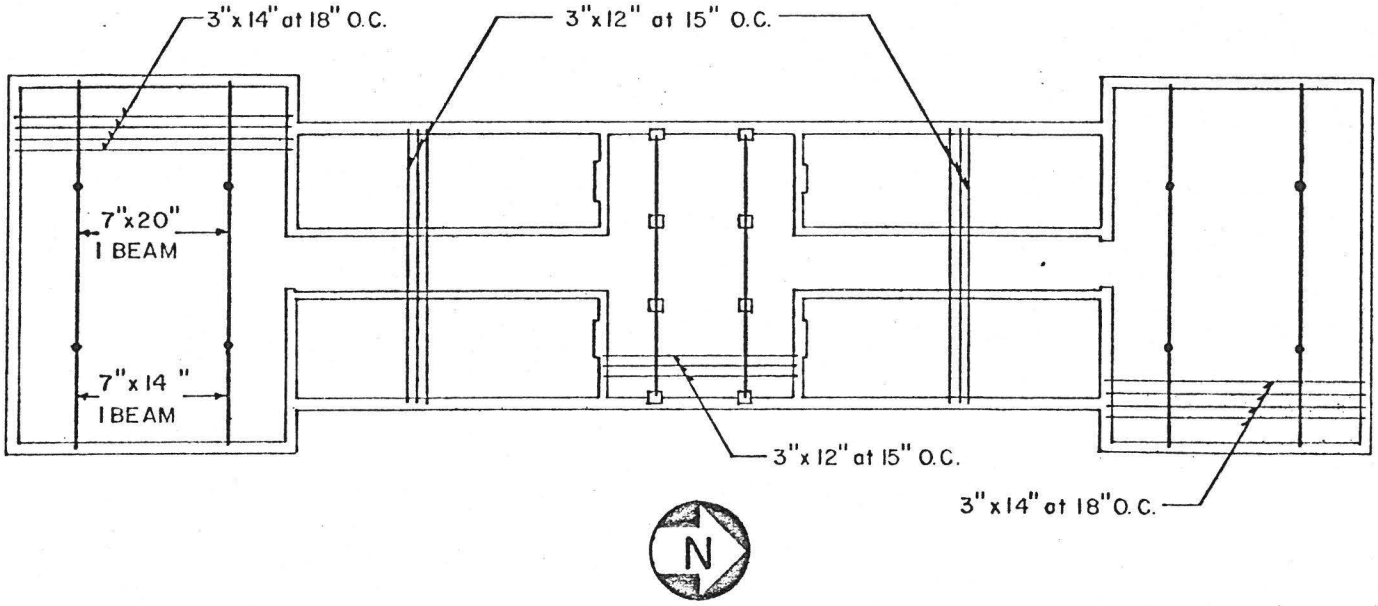
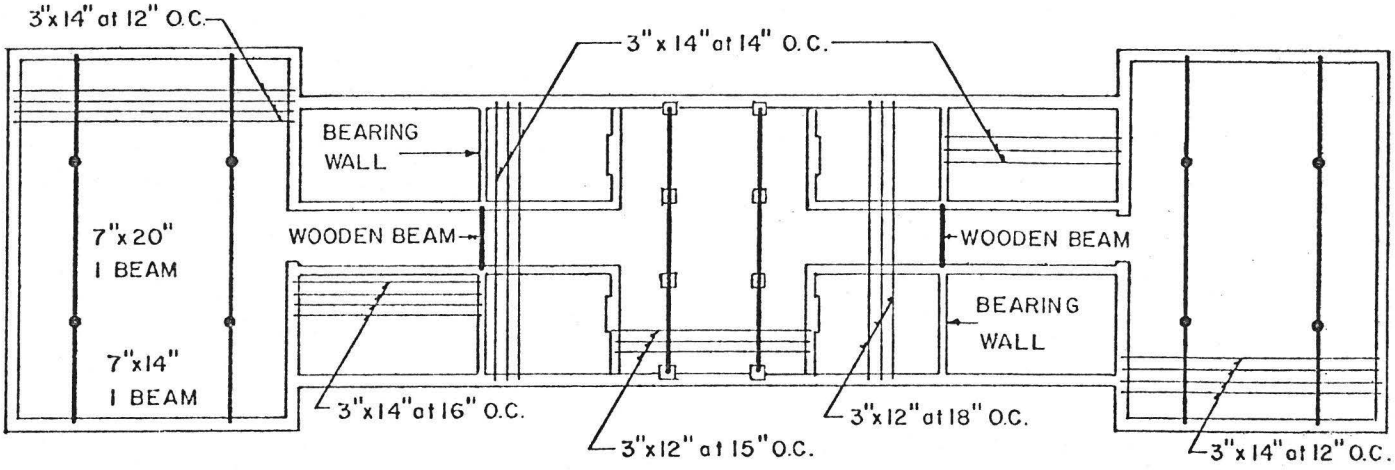


Figure 3



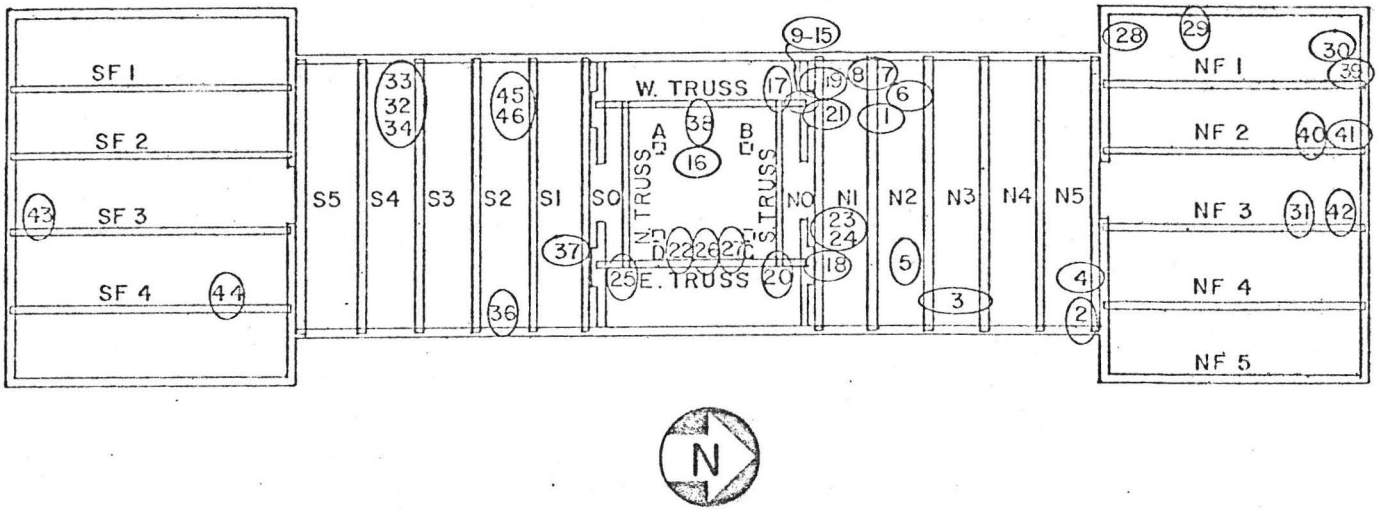
STRUCTURAL FRAMING 2nd FLOOR

FIGURE 4



STRUCTURAL FRAMING 1st FLOOR

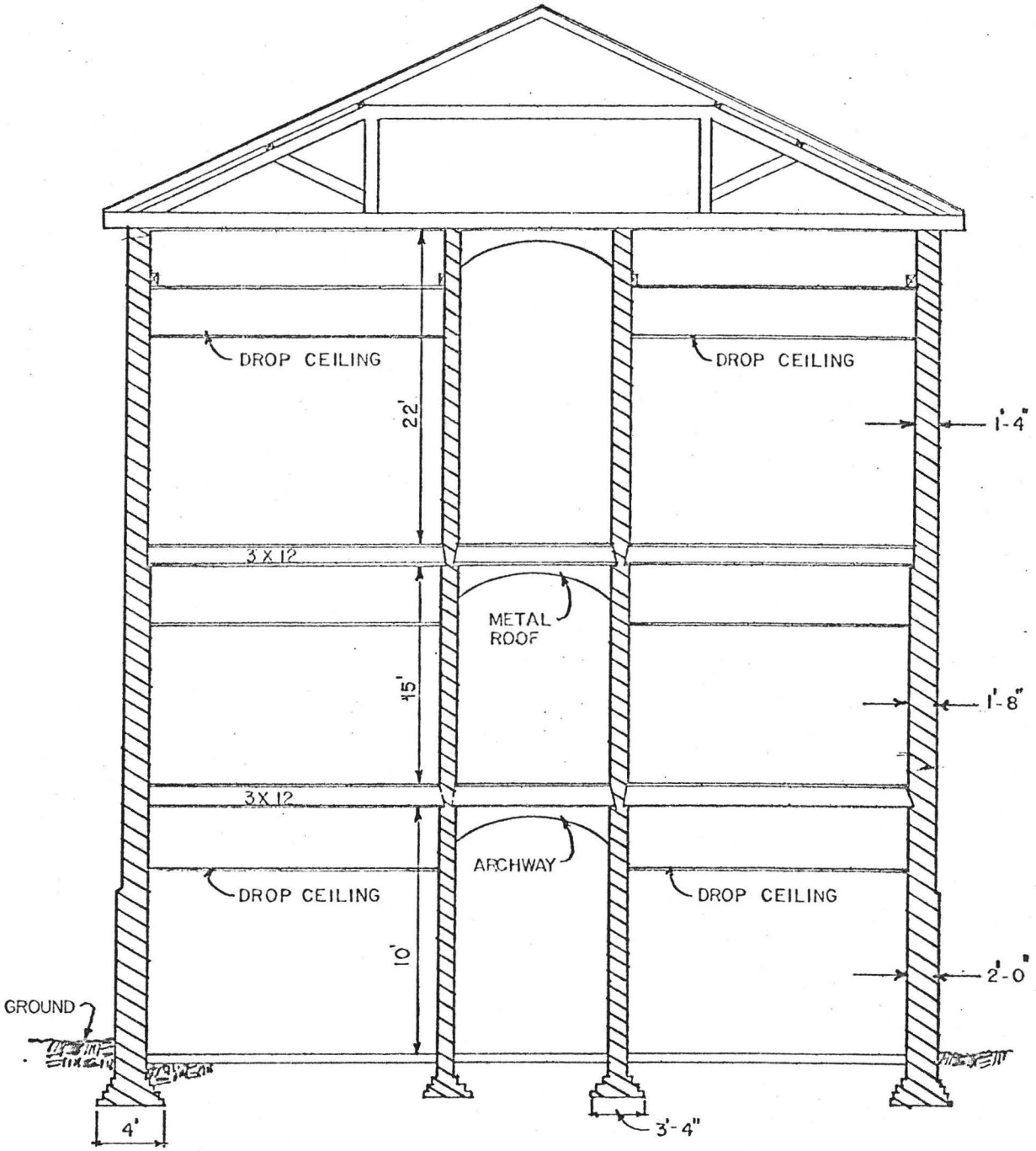
FIGURE 5



KEY PLAN FOR STRUCTURAL INSPECTION PHOTOGRAPH LOCATIONS ROOF FRAMING

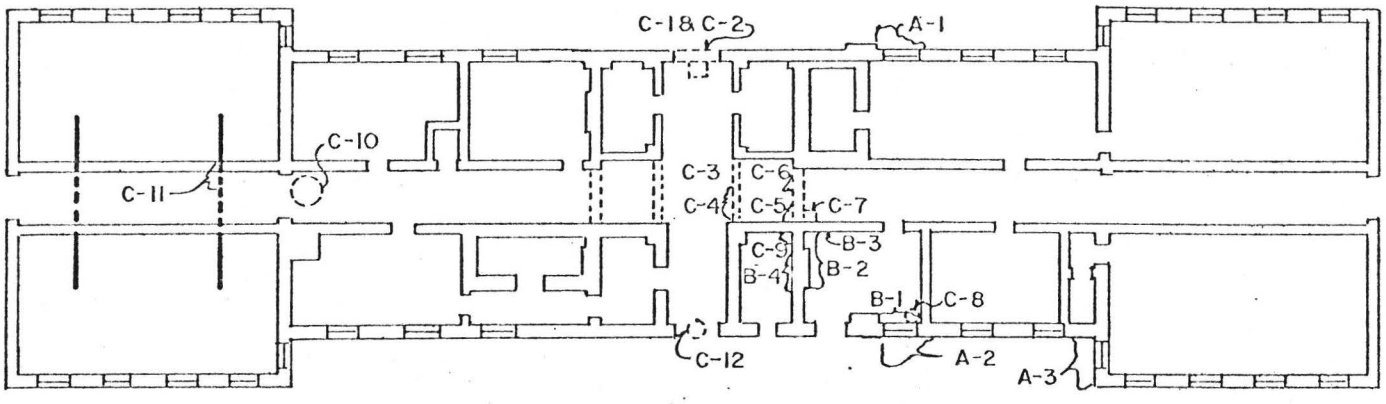
FIGURE 6

DH.



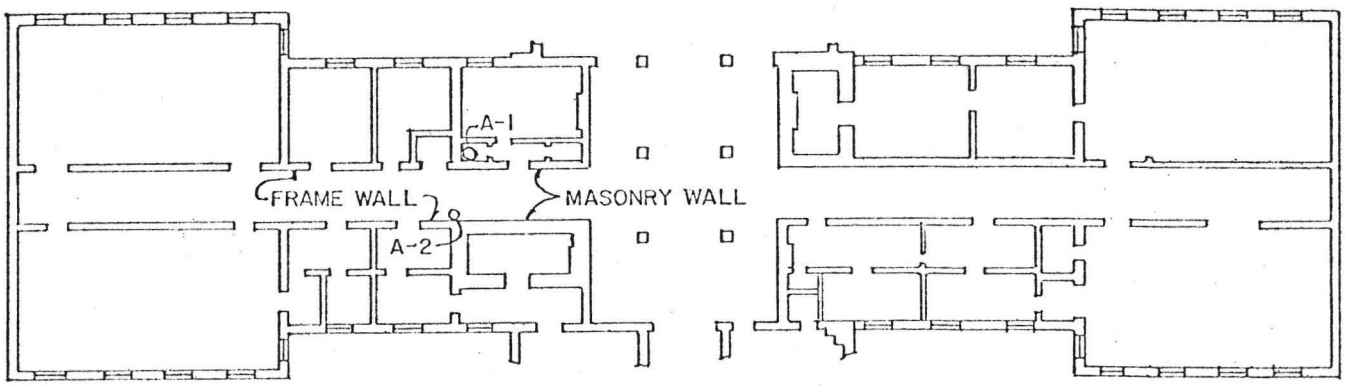
SECTION THRU NORTH WING

FIGURE. 7



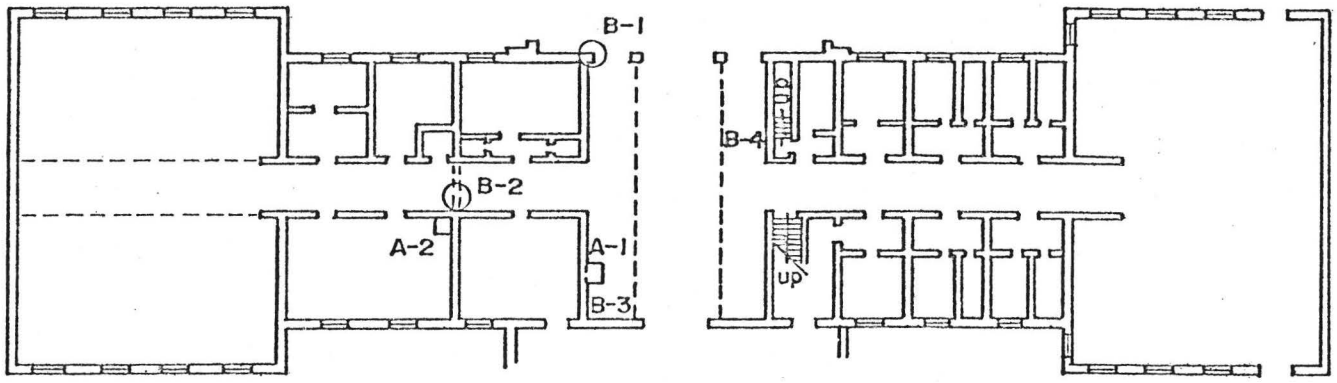
KEY PLAN FOR STRUCTURAL INSPECTION
I BASEMENT

FIGURE 8



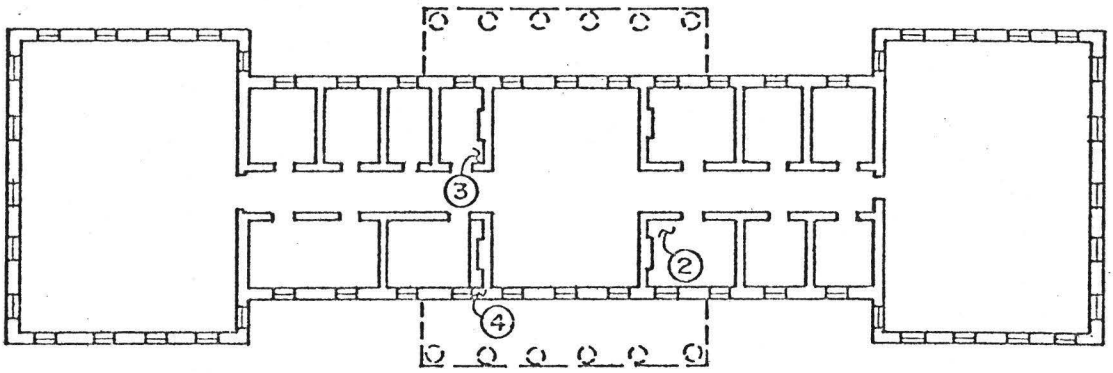
KEY PLAN FOR STRUCTURAL INSPECTION
II 1st. FLOOR

FIGURE 9



KEY PLAN FOR
STRUCTURAL INSPECTION
OF
III 2ND FLOOR PLAN

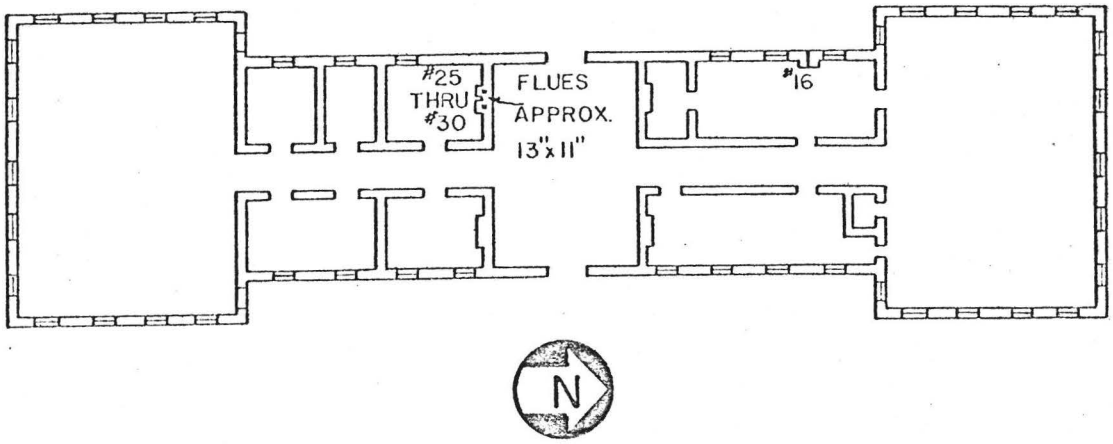
FIGURE. 10



KEY PLAN FOR
STRUCTURAL INSPECTION
1902 SECOND FLOOR

① VISUAL INSPECTION MADE WITHOUT CORING OR BREAKING OUT BRICK, SEE DESCRIPTIONS.

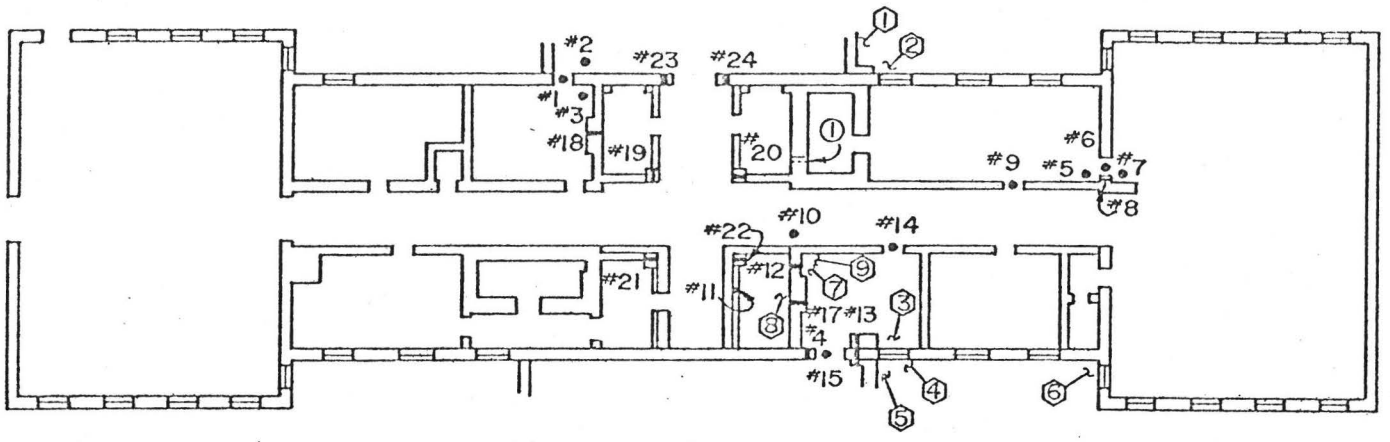
FIGURE. 11



KEY PLAN FOR STRUCTURAL INSPECTION
FIRST FLOOR

⊢ CORE THRU WALL (HORIZ)

FIGURE 12

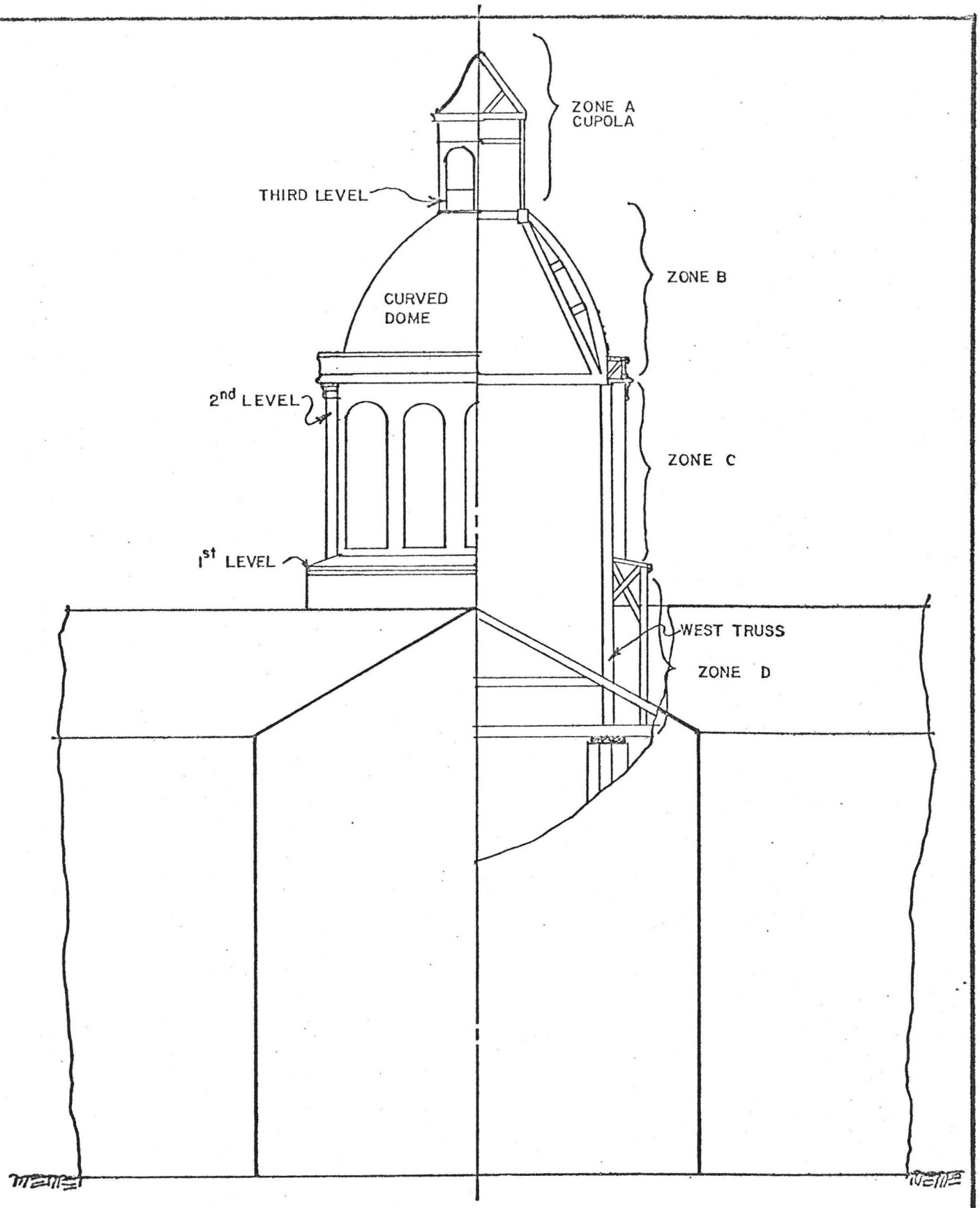


KEY PLAN FOR STRUCTURAL INSPECTION 1902 BASEMENT FLOOR

NOTE: REFERENCE TO APPENDEX

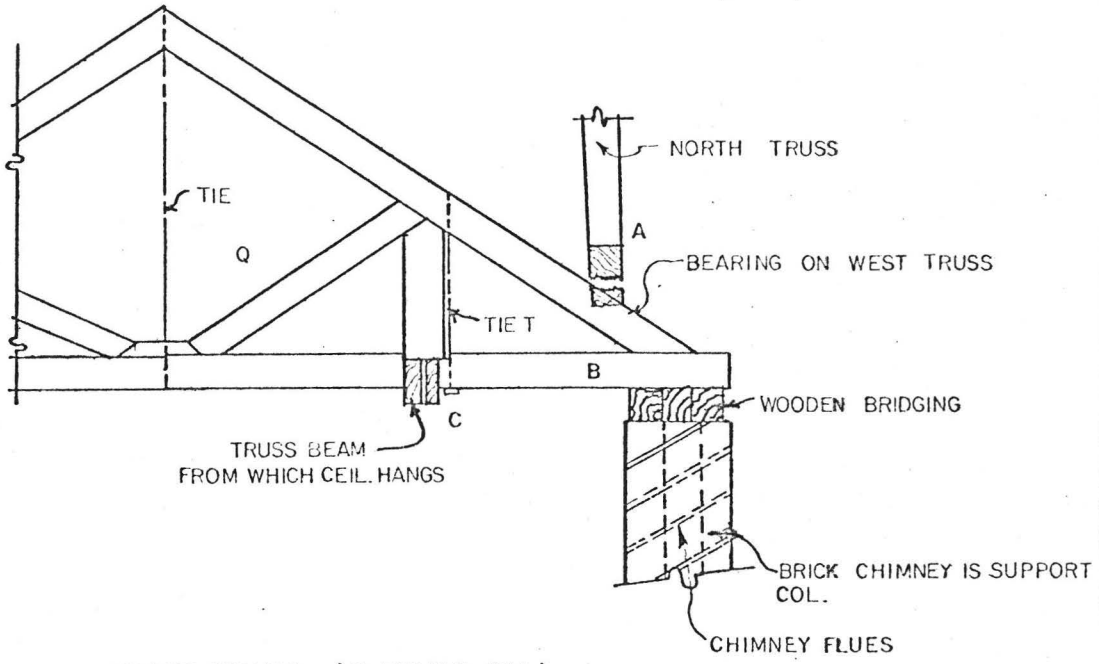
- • CORE DOWN THRU FLOOR SLAB (VERT)
- ⊢ CORE THRU WALL (HORIZ)
- ⓘ SEE DETAIL, FOOTING EXCAVATED THIS AREA
- ⓘ VISUAL INSPECTION MADE WITHOUT CORING OR BREAKING OUT BRICK, SEE DESCRIPTIONS.

FIGURE. 13

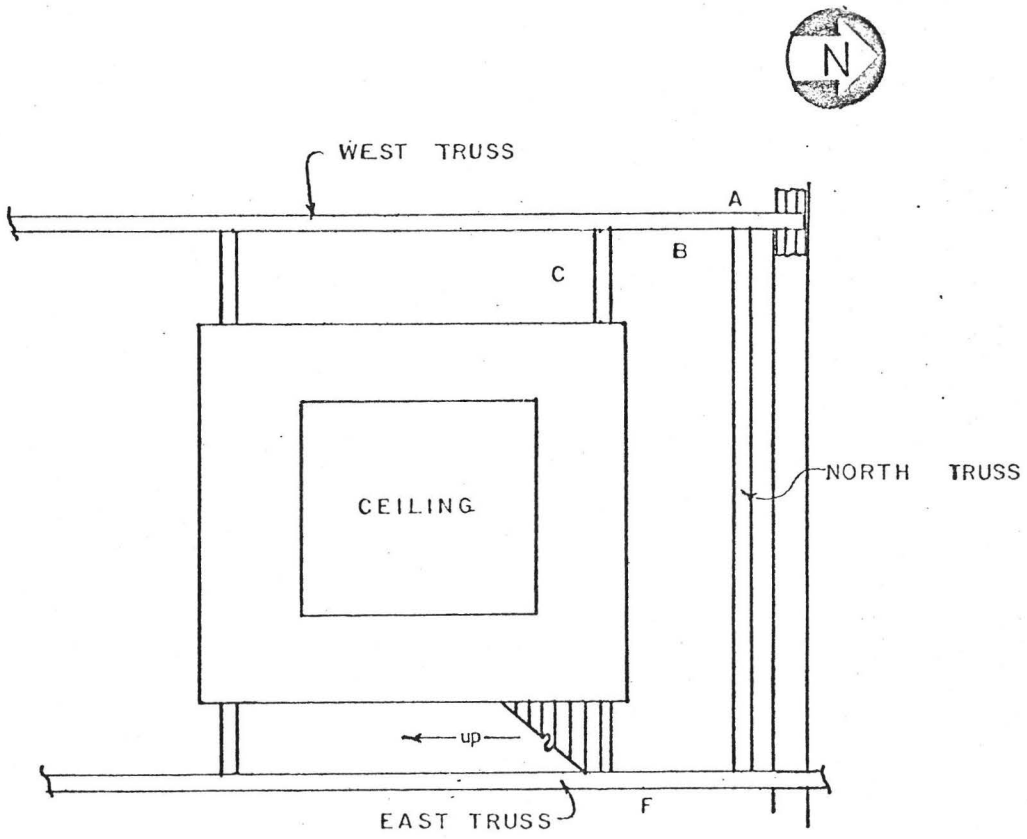


EAST WEST SECTION
(LOOKING SOUTH)

FIGURE. 14

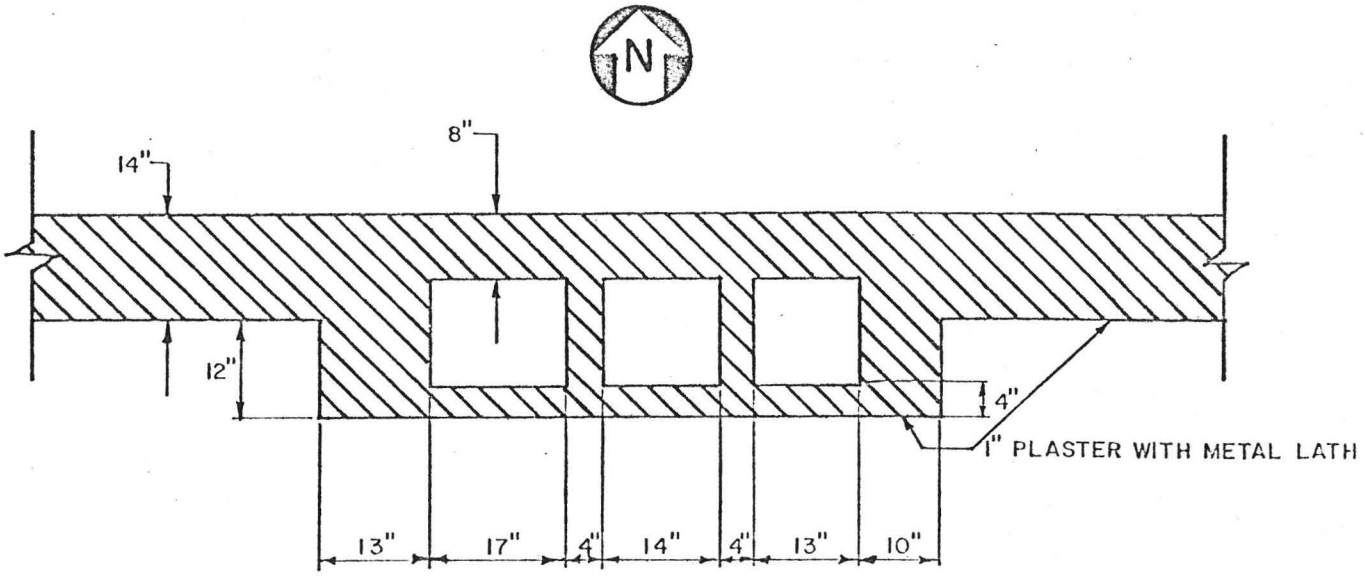


WEST TRUSS (E. TRUSS SIM.)



PLAN OF TOP OF 2nd FLOOR (CEIL. IN DOME)

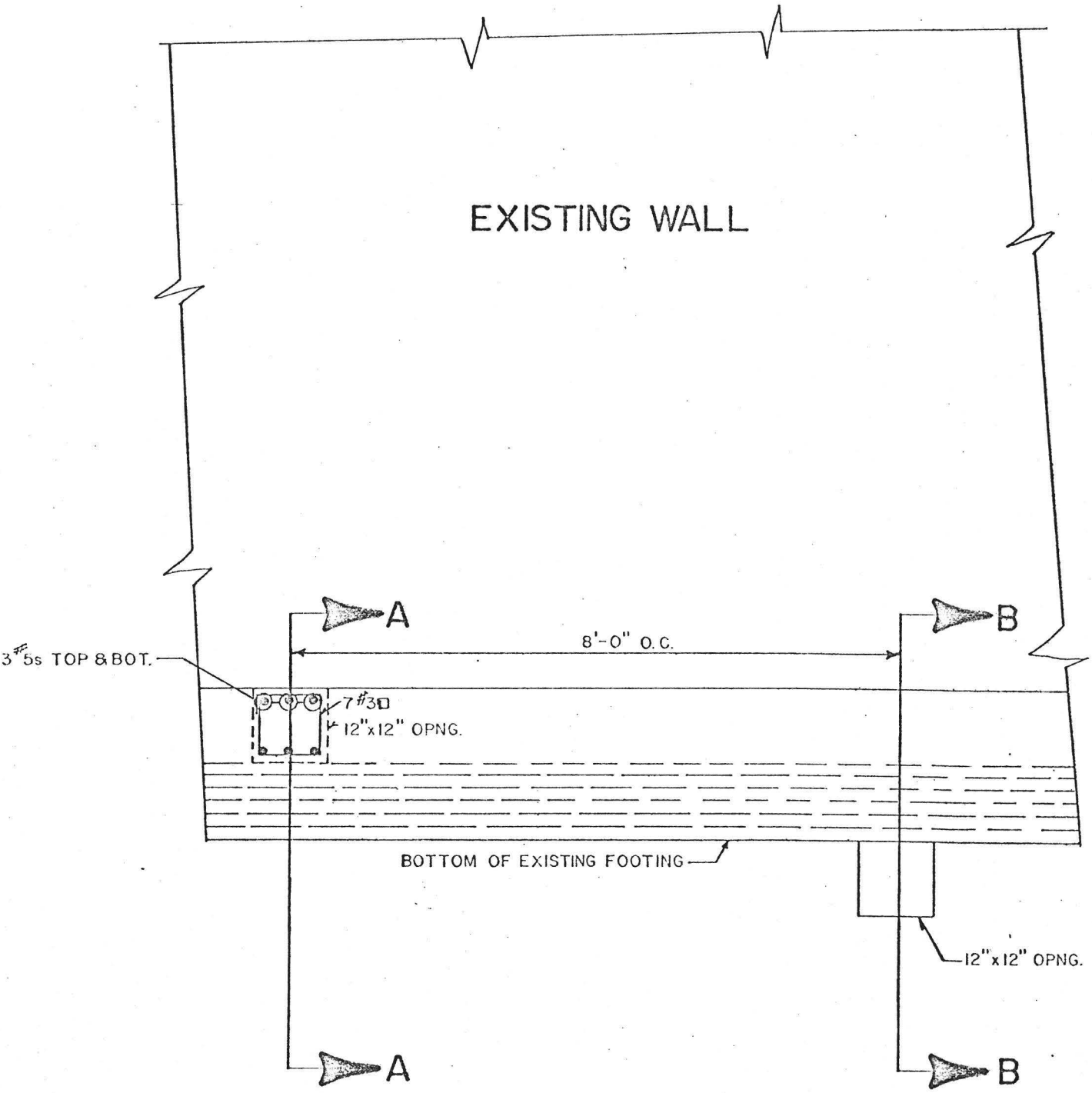
FIGURE 15



SOUTH WEST 1845 FIREPLACE IN CENTER SECTION

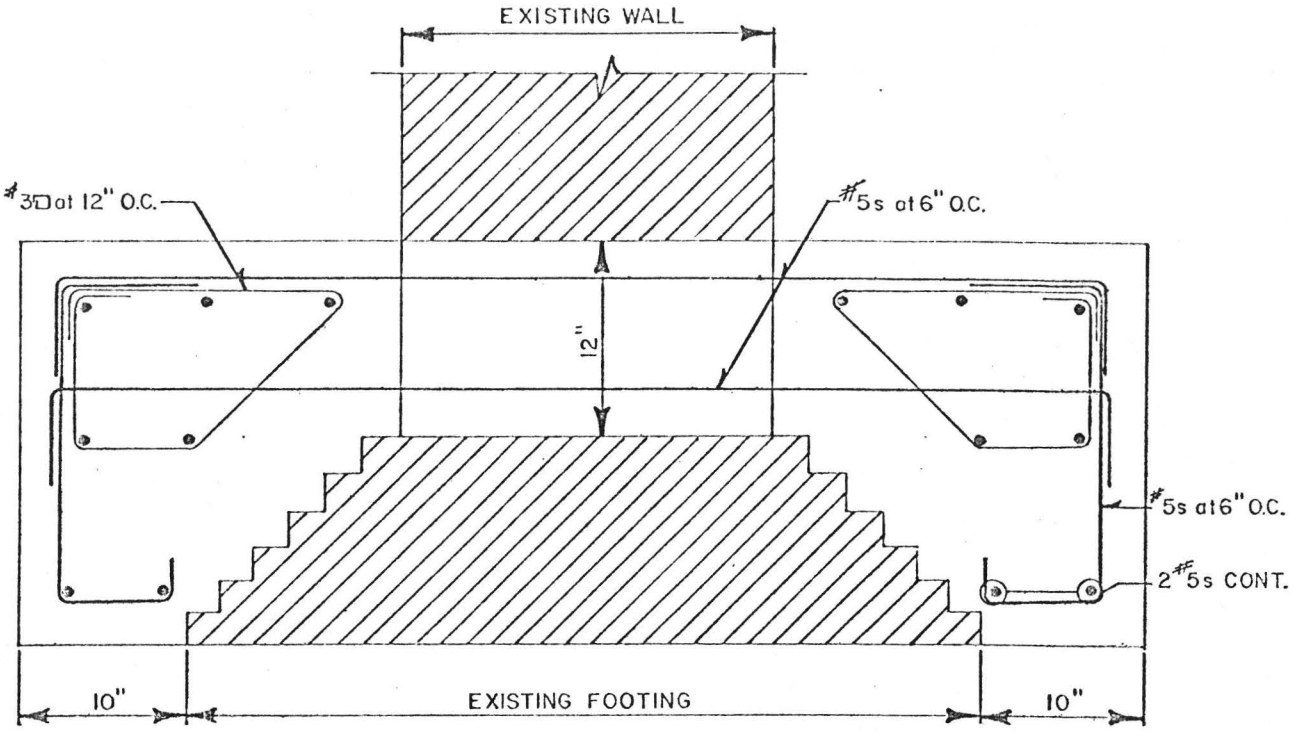
FIGURE. 16

P.H.

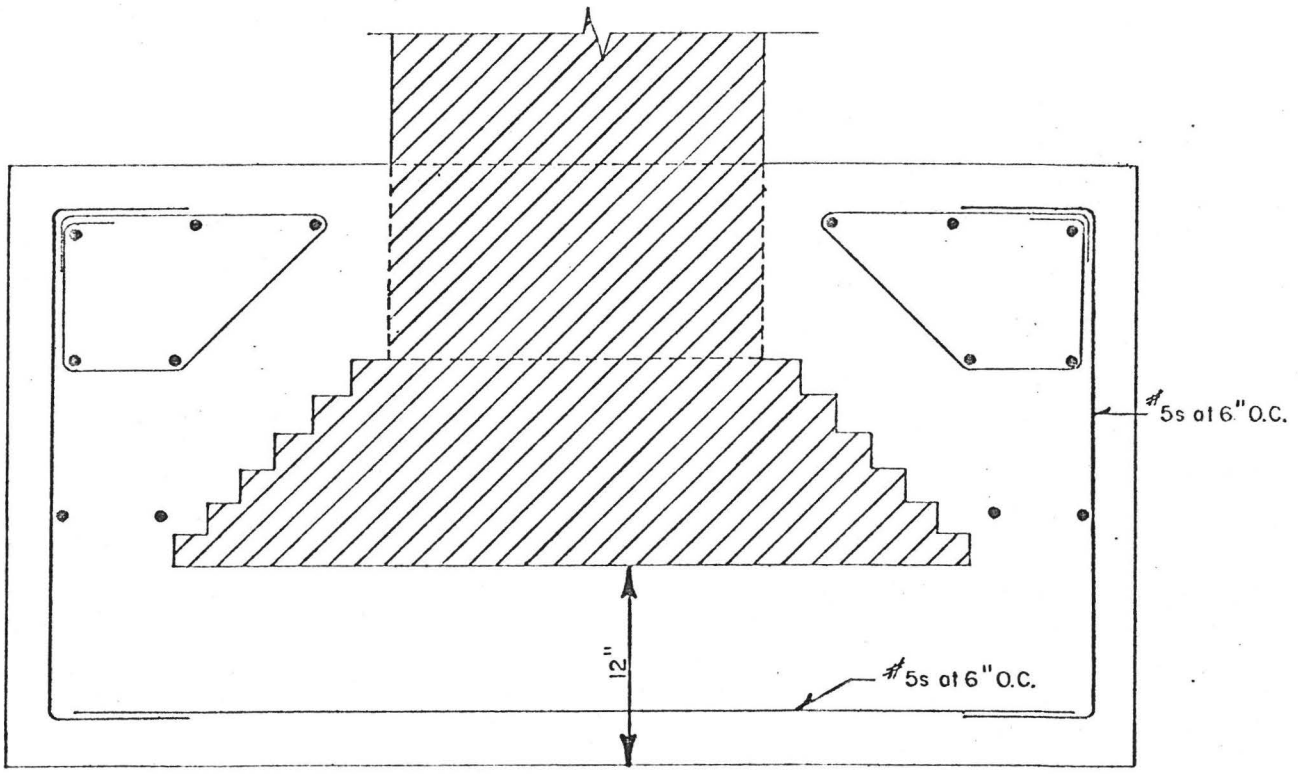


TYPICAL FOOTING & WALL ELEVATION

FIGURE 17



SECTION A-A



SECTION B-B

FIGURE 18

STRUCTURAL MATERIALS EVALUATION
OLD FLORIDA STATE CAPITAL
TALLAHASSEE, FLORIDA

April 28, 1978
File No. 78-4553

William Bishop Consulting Engineers
P.O. Box 3407
Tallahassee, Florida 32303

Subject: Structural Materials Evalution of the Old Florida State Capitol, Tallahassee, Florida

Dear Sir:

We have completed the testing and observations on the above referenced project authorized by your firm. The locations of the test corings, samples and observations are shown on the attached drawings (Sheets 1, 2 and 3).

The actual work is divided into four categories. These categories are:

1. Coring throught walls and slabs. Results of these corings are shown in Table 1.
2. Observations of foundations at selected excavated areas. Sketches of these areas are shown on pages 8 through 11.
3. Observations made through holes in walls, ceilings, floors and in the attic are listed on pages 12 to 16 .
4. Laboratory test results are summarized in Tables 2 and 3. Methods of testing are discussed on page 17.

It has been a pleasure working with you in this most interesting structural evaluation.

Yours very truly,

ARDAMAN & ASSOCIATES, INC.

Donald W. Carraway
Principal

William Miley, P.E.
Eng. Reg. No. 6677
State of Florida

DWC/WM:cs

TABLE I

Coring No.	Location	Description/Comments
1	Electric Room Basement Slab	7" concrete, clay underneath
2	Electric Room Basement Slab	1" concrete, 17" brick and mortar, 5" concrete at bottom, clay
3	Electric Room Basement Slab	6" concrete, clay underneath
4	Snack Bar Basement Wall	26-1/2" through wall (including plaster) original outside 1845 wall mortar soft, brick appears O.K. Drills very easy, lead anchors will not hold
5	Room G-36 Basement Slab	6" concrete slab, layer of sand, 3" mortar mix, loose sand underneath felt something hard at 34" below top of slab with probe, cannot core through sand to determine what.
6	Room G-36 Archway Door Slab	This archway opening was apparently cut through 1845 wall, found two layers of concrete, total 5", then brick and mortar for 30" (±)
7	Room G-36 Basement Slab	3" (±) concrete, one brick, mortar and pieces of brick
8	Room G-36 Wall	Original 1845 outside wall, 37-3/4" through brick and mortar. Mortar is soft.
9	Doorway Room G-36 Basement Slab	Two layers of concrete, total 4-1/2" (±) brick and mortar, brick very soft, broke up in pieces.
10	N-S Hall at Arch Slab	Concrete 3" thick, conduit or pipe under slab, clay under slab.

TABLE I, continued

Coring No.	Location	Description/Comments
11	Wall Between Storage Room & East West Hall Basement	Wall 9" thick, brick and mortar condition good
12	Wall between Storage and Snack Bar	Wall 22" thick, most of mortar disintegrated, brick soft
13	Column in Snack Bar Basement	Core 83" through, one layer of sand/mortar 12-18" disintegrated, plaster approximately 4' from start (inside of 1845 outside wall). It was found later that this column rests on terrazo concrete slab with no foundation.
14	Center of Snack Bar Door in Slab Basement	1-1/2" Concrete over pieces of brick and mortar, approximately 6"
15	Slab in Opening Between Snack Bar Rooms Basement	Two layers of concrete, top - 4-3/4", bottom-4-1/4" (sand mix) then brick and mortar down to approximately 3'6" from floor level brick and mortar soft (This core would be through 1845 outside wall footing)
16	West Wall First Floor Through Vertical Crack	From outside - one brick, badly cracked, one firebrick, good condition, opening two bricks probably added to fill opening. 10-1/2"-outside brick and firebrick, 2'1" - open, 44" total through
17	Fireplace, Chimney In Snack Bar Basement	32-1/2" through, brick and mortar soft. Several bricks almost disintegrated in coring. This core was taken to one side of the fireplace opening.

TABLE I, continued

Coring No.	Location	Description/Comments
18	Fireplace Electric Room Basement	39" (±) Brick and mortar, sand beyond (sand would be below floor in mail room, mail room floor is above electric room floor). Part of brick is much newer.
19	Column in Mail Room Basement	25" through column, brick and mortar in good condition.
20	Column, Janitors Storage Basement	25" through column, brick and mortar in good condition.
21	Column, Storage Room Basement	25" through column, brick and mortar in good condition, one void on one side of core, apparently missing one brick or piece of brick in cneter of column.
22	Column in Storage Room By Snack Bar Basement	25" through column, brick and mortar in good condition.
23	Column, South Side, East-West Hall at Steps, Basement	31-1/2" through column, brick and mortar in good condition.
24	Column North Side East-West Hall at Steps, Basement	31-1/2" through column, brick and mortar in good condition

TABLE I, continued

Coring No.	Location	Description/Comments
25	1st Floor (Middle Floor) Mens Room 1' West of Edge of Fireplace	Note: Cores 25-30 were only drilled 12" deep to locate chimney openings. Core shows plaster, small gap, more plaster, one brick, then opening. 7" from face of plaster to opening, 13.5" deep opening
26	2' West of Edge of Fireplace	Plaster, Brick 7 mortar for one foot
27	2'8"(±), West of Edge of Fireplace	Had to move hole away from 3' mark to miss wood plastic, brick and mortar for one foot
28	4' West of Edge of Fireplace	Plaster, brick and mortar for 7.5", 13" opening. This hole is one west edge of flue opening.
29	5' West of Edge of Fireplace	Plaster and brick for 7". Mortar to end of core at 12". Looks same as brick mortar. It was not added at a later date.
30	4'8" (±) West of Edge of Fireplace	Plaster, brick and mortar for 7.5", 13" opening. Flue is approximately 11" wide.

TABLE 2

Sample Marking	Location	Compressive Strength (psi) Saturated	Room Moisture	Comments
A1 & A2	1845 Foundation West Wall	2075	1650	Apparently, small imperfections affect strength more than moisture
B1 & B2	1845 Foundation West Wall	1370	1110	
D1 & D2	Fireplace, Snack Bar (1845)	460	544	
C1 & C2	Inside Wall Footing, Opposite Fireplace in Snack Bar (1845)	1090	1240	
E1	Fireplace, Snack Bar (1845)	---	268	E1 & E 2 are half brick with mortar in between
E2	Fireplace, Snack Bar (1845)	---	375	
IA & IB	Inside Wall Footing, Snack Bar (1845)	592-Natural Moisture		
OA & OB	Outside Wall Footing, Snack Bar	296-Natural Moisture		
02	Fireplace (near top) Supports Truss (NE Support) (1845)		499	
1	Top of Fireplace West Wall		960	This brick is newer than 1845
1B	Brick from inside walls, second floor (1845)		1085	
2B	Brick from inside walls, second floor (1845)		1020	
3B	Brick from inside walls, second floor (1845)		1140	

TABLE 3

MORTAR TESTS

Sample Marking	Location	Unconfined Compressive Strength (psi)
1A	Fireplace, West Wall	140
1B	Fireplace, West Wall	130
3A	Fireplace (NE Truss support)	181
3B	Fireplace (NE Truss Support)	268
02	Fireplace (NE Truss Support)	48
A	Fireplace in Snack Bar	89
B	Fireplace in Snack Bar	108
C	Fireplace in Snack Bar	71
1A	Fireplace in Mens Restroom 1st Floor, Southwest Brick Bearing Wall	125

ARDAMAN & ASSOCIATES, INC.
P. O. Box 13003
ORLANDO, FLORIDA 32809
(305) 855-3860

JOB 1845-1902 Capital Building

SHEET NO. 1 OF 4

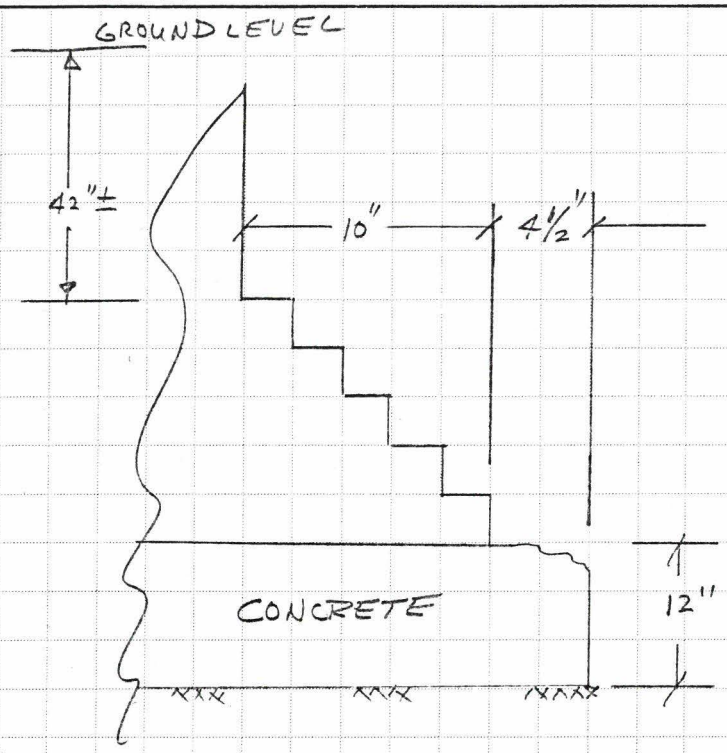
CALCULATED BY WM DATE 4/14/78

CHECKED BY _____ DATE _____

SCALE _____

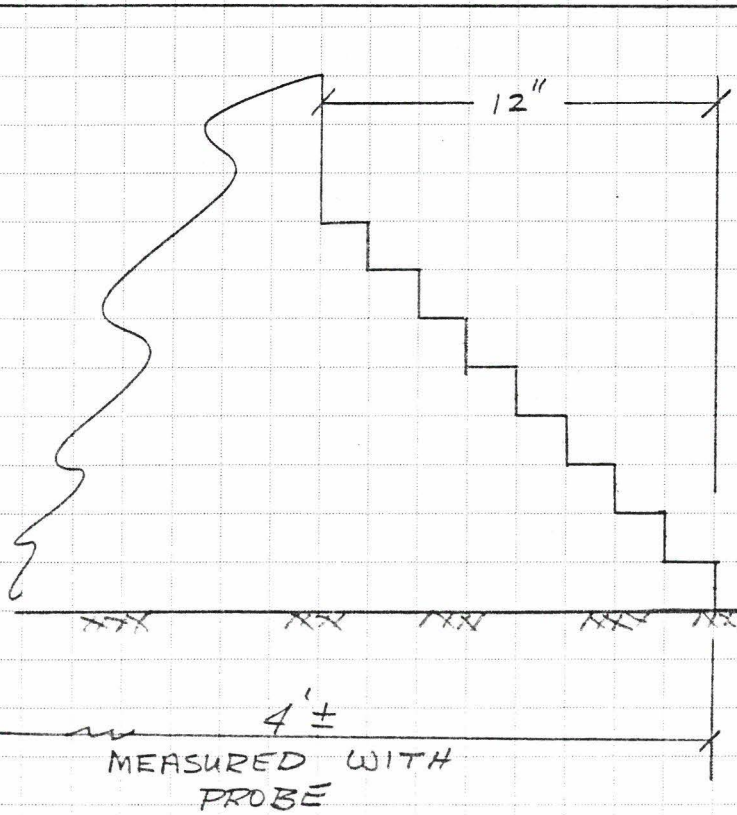
FOUNDATIONS

1



MORTAR & BRICK IN GOOD CONDITION - NO VISIBLE CRACKING IN MORTAR, BRICK, OR CONCRETE

2

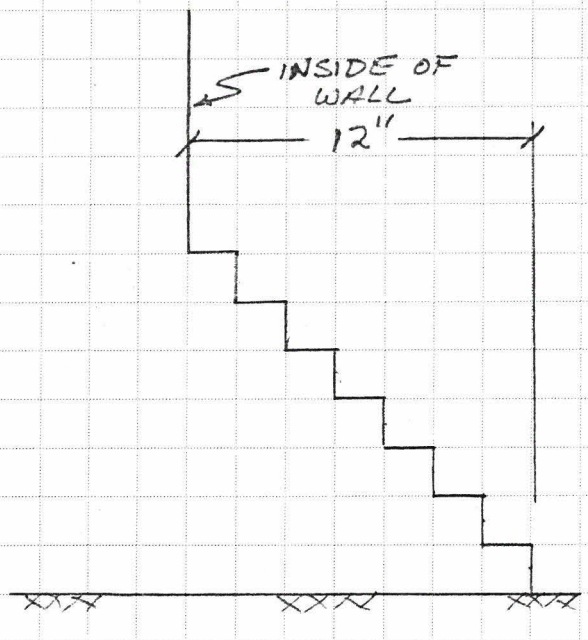


1) MORTAR IS LIKE WET SAND ON FOUNDATION,
2) BRICKS ARE IN FAIR COND.
3) BOTTOM LAYER OF BRICK ARE LAID CROSSWAYS (LENGTH OF BRICK PERPENDICULAR TO WALL)
4) NO VISIBLE CRACKING

ARDAMAN & ASSOCIATES, INC.
P. O. Box 13003
ORLANDO, FLORIDA 32809
(305) 855-3860

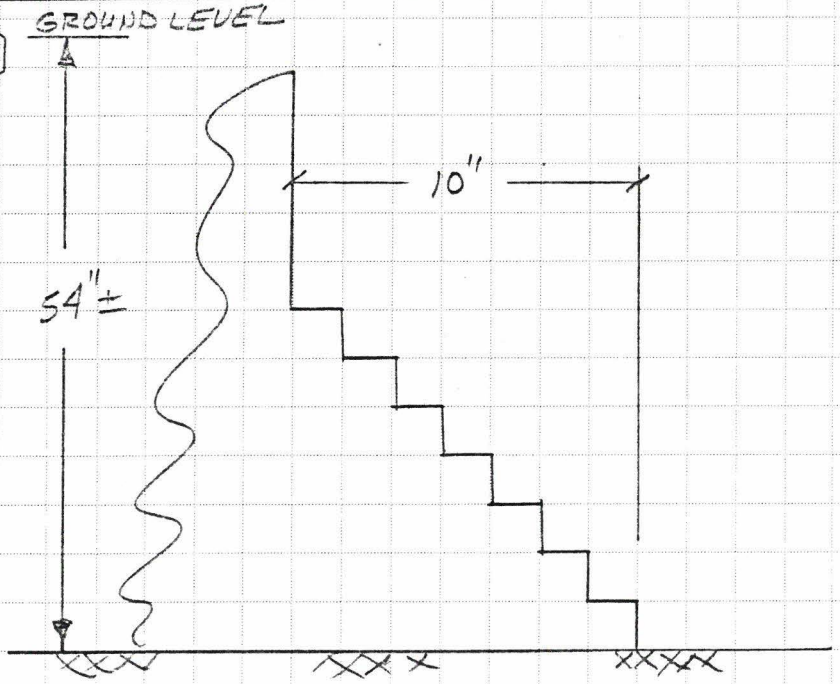
JOB 1845-1902 Capital Building
SHEET NO. 2 OF 4
CALCULATED BY WM. DATE 4/14/78
CHECKED BY _____ DATE _____
SCALE _____

(3)



1) MORTAR IS SOFT. BRICK CONDITION - FAIR
2) NO VISIBLE CRACKS IN BRICK OR MORTAR
3) BOTTOM LAYER BRICK CROSSWAYS

(4)



1) MORTAR IS SOFT BRICKS IN FAIR CONDITION
2) NO VISIBLE CRACKING

ARDAMAN & ASSOCIATES, INC.
P. O. Box 13003
ORLANDO, FLORIDA 32809
(305) 855-3860

JOB 1845-1902 Capital -10-

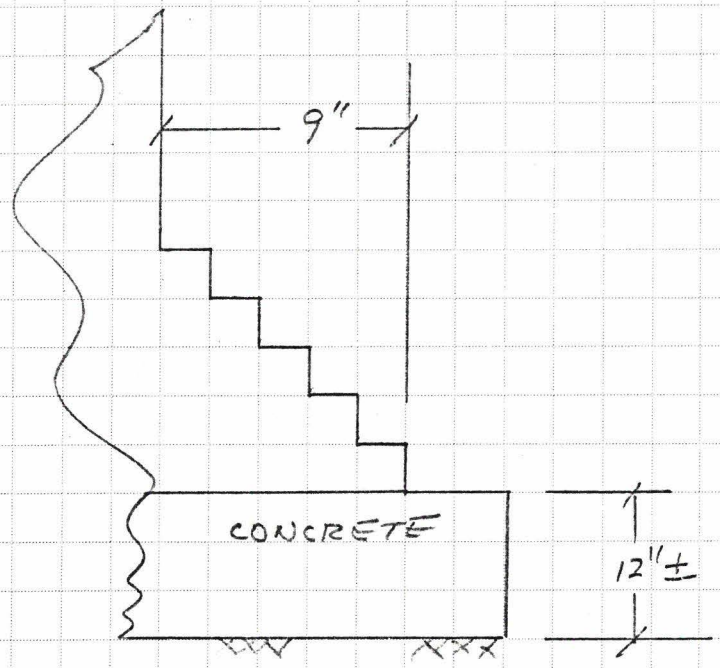
SHEET NO. 3 OF 4

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

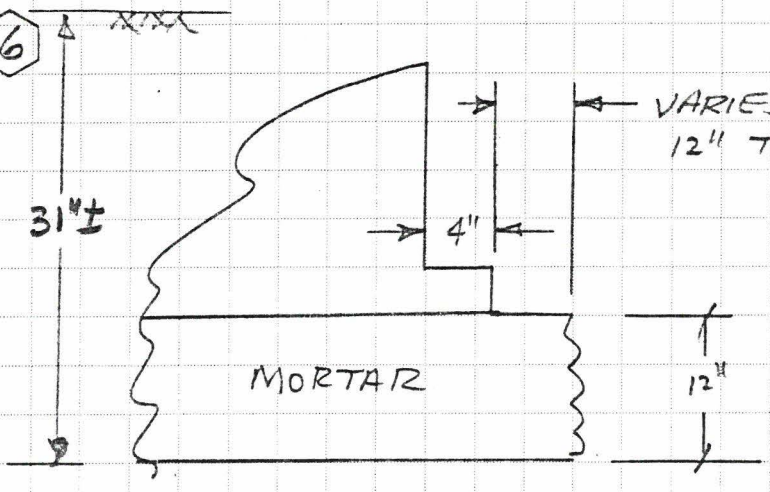
SCALE _____

5



1) BRICK & MORTAR ARE IN GOOD CONDITION
2) NO VISIBLE CRACKING
3) CONCRETE APPEARS TO HAVE A SLAG AGGREGATE

6



1) BRICK & MORTAR IN FAIR CONDITION
2) MORTAR/CONCRETE IN FOOTING VERY SOFT

ARDAMAN & ASSOCIATES, INC.
P. O. Box 13003
ORLANDO, FLORIDA 32809
(305) 855-3860

JOB 1845-1902 Capital Building -11-

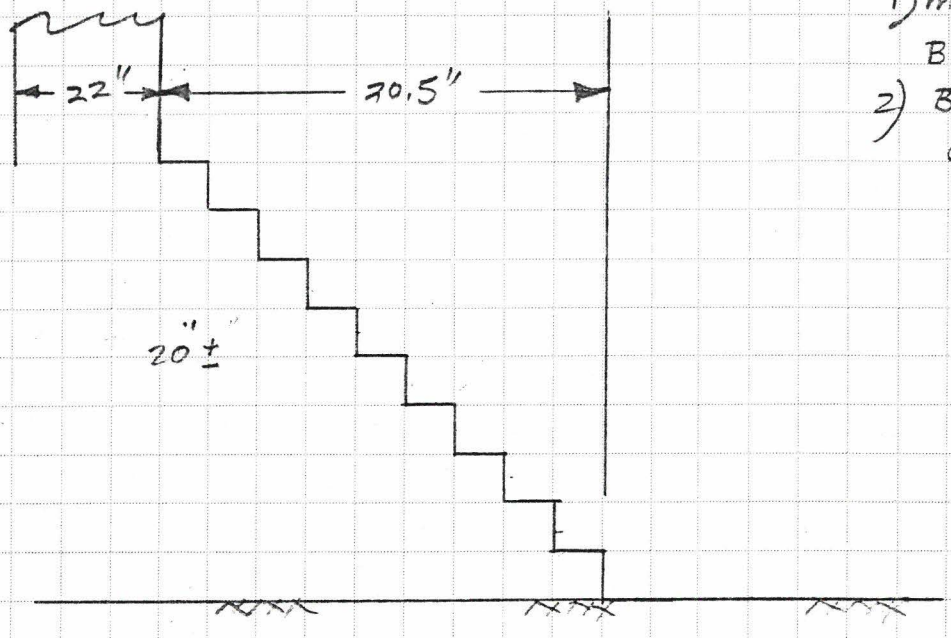
SHEET NO. 4 OF 4

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

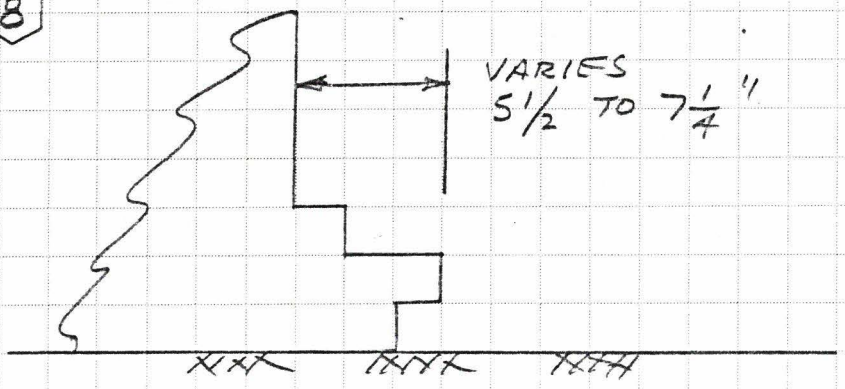
SCALE _____

7



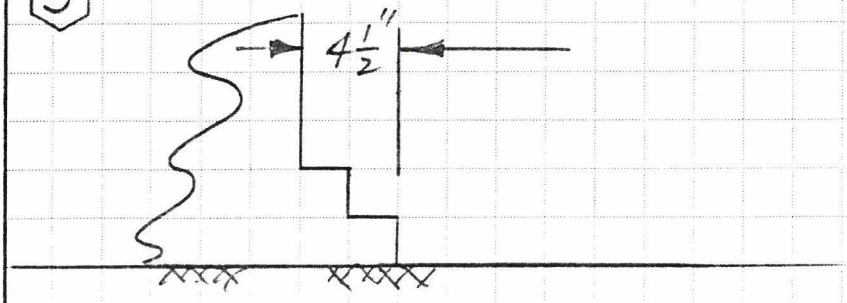
1) MORTAR SOFT
BRICK FAIR
2) BOTTOM ROW IS
CROSS WAYS

8



1) MORTAR SOFT
BRICK FAIR

9



1) BRICK & MORTAR
FAIR - APPARENTLY
MOISTURE HAS
NOT BEEN AS
HIGH THIS LOC.

Observations

(1.) A visual inspection was made of this area through a hole previously cut for piping. The following was observed:

A. Dimensions:

1/2"	Steel Plate
4-1/2"	Void
5'2"	Brick
5'7"	Overall

B. Brick and mortar in fair condition

(2.) Area Under Stairway at Fireplace

A visual inspection was made of this area by going through a hole in the wall already existing. The follwoing was observed:

A. Dimensions: Brick Wall: 24"
Two Coats of Plaster (brown color): 1/2"

B. This fireplace supports the north end of main truss on east side of dome. The fireplace projects 8" from wall is 68" wide and has a 14" deep cavity.

C. The floor joists are 2 7/8" x 12" at 16" on centers.

D. The flooring consists of tongue and groove 1"x6"'s.

(3.) The following observations were made:

A. Floor joists 2-7.8" x 12" at 16" O.C, running east west and resting on wood seat. The flooring consists of tongue and groove 1"x6"'s. Ceiling is 6'± down.

B. Pilaster does not appear to be cracked. Plaster covers bricks.

Observations, continued

(4.) Removed towel holder in restroom, (top floor).

Immediately behind the towel holder was an opening, apparently a window in the 1845 wall. I observed brick and mortar in fair condition. Some bricks have been removed to clear pipes.

Roof Area North of Dome Area:

1. Roof columns leaning to north several inches, particularly column on the west.

2. Trusses (running north-south)

   A. Compression members loose
   B. Weather check and/or horizontal shear failure on one top chord.
   C. Bottom chord splices are 1'± apart, causing B. chord to be 1/2 effective.
   D. Northeast truss, south end badly twisted.
   E. First crossbeam north of dome rotten.

Chimney on Second Floor in Mens Restroom:

A series of holes were drilled in the chimney to determine the number and size of flues, and thickness of brick walls. A sketch was made of a cross section of the chimney which is to be included in the main body of the report

ARDAMAN & ASSOCIATES, INC.
P. O. Box 13003
ORLANDO, FLORIDA 32809
(305) 855-3860

JOB _____

SHEET NO. 1 OF 3

CALCULATED BY _____ DATE _____

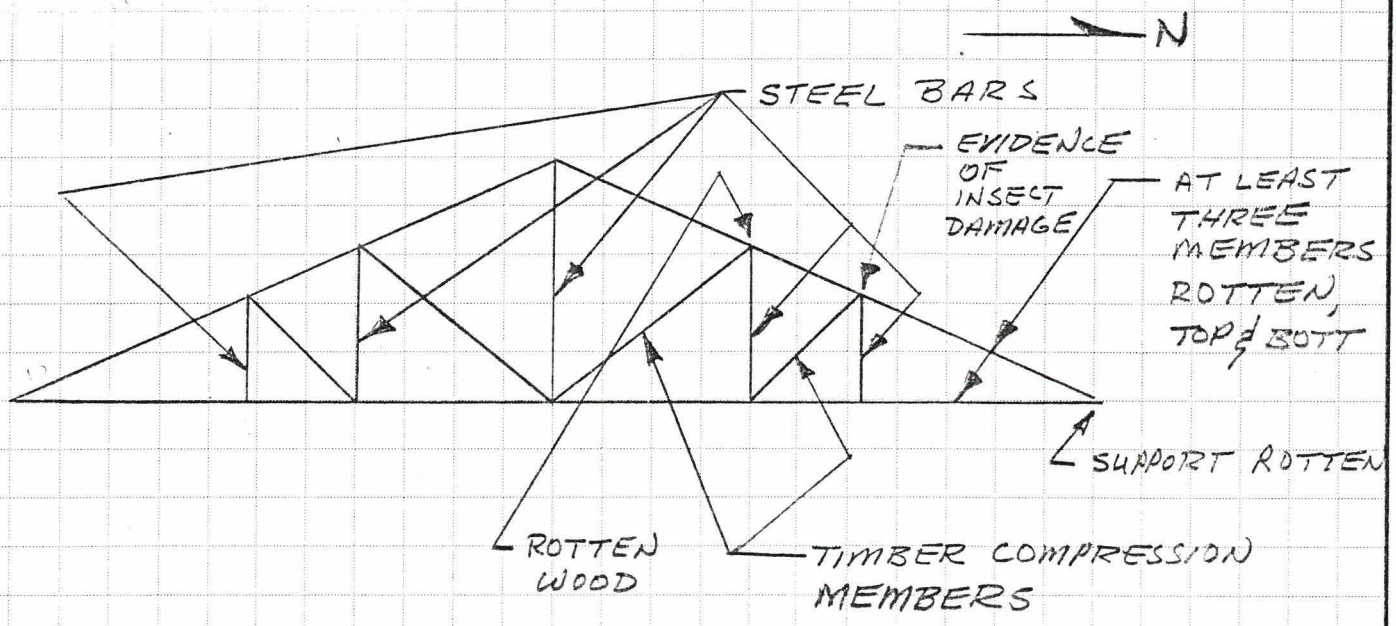
CHECKED BY _____ DATE _____

SCALE _____

ATTIC INSPECTION

A visual inspection was made in the attic area of the major structural items. The following comments and sketches show the deficiencies found.

Dome area West side, main truss running North-South.



1) ALL COMPRESSION MEMBERS LOOSE
2) TRUSS IS SAGGING BADLY

ARDAMAN & ASSOCIATES, INC.
P. O. Box 13003
ORLANDO, FLORIDA 32809
(305) 855-3860

JOB

SHEET NO. 2 OF 3

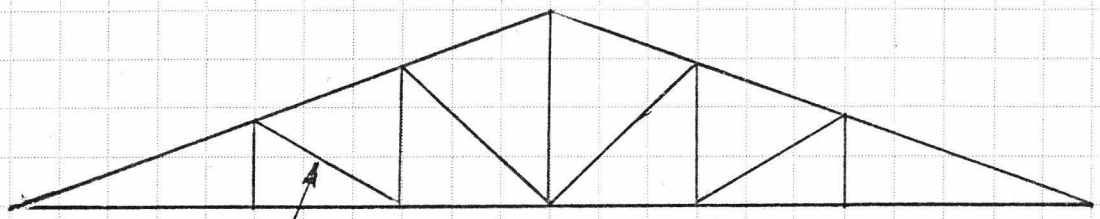
CALCULATED BY DATE

CHECKED BY DATE

SCALE

EAST MAIN TRUSS RUNNING NORTH & SOUTH

N



COMPRESSION MEMBER LOOSE

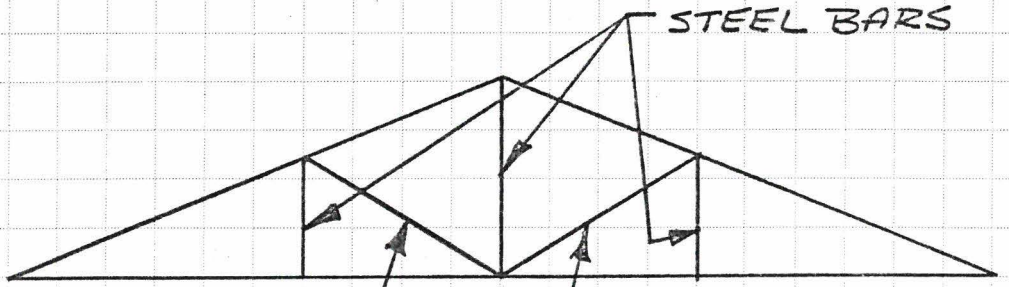
COMPRESSION JOINTS HAVE BEEN SHIMMED

1) TIMBER IS IN GOOD CONDITION BUT TRUSS IS SAGGING BADLY.

2) TIMBER BEAM SUPPORTING BOTTOM OF STAIRS IN THIS AREA HAS BEEN DAMAGED BY INSECTS.

TRUSS RUNNING EAST-WEST ON SOUTH SIDE OF DOME

E



STEEL BARS

GAP BETWEEN TOP CHORD & COMPRESSION MEMBERS

1) THIS TRUSS BEARS ON TOP CHORDS OF MAIN NORTH SOUTH TRUSSES

2) TIMBER APPEARS TO BE IN GOOD CONDITION.

ARDAMAN & ASSOCIATES, INC.
P. O. Box 13003
ORLANDO, FLORIDA 32809
(305) 855-3860

JOB

SHEET NO. 3 OF 3

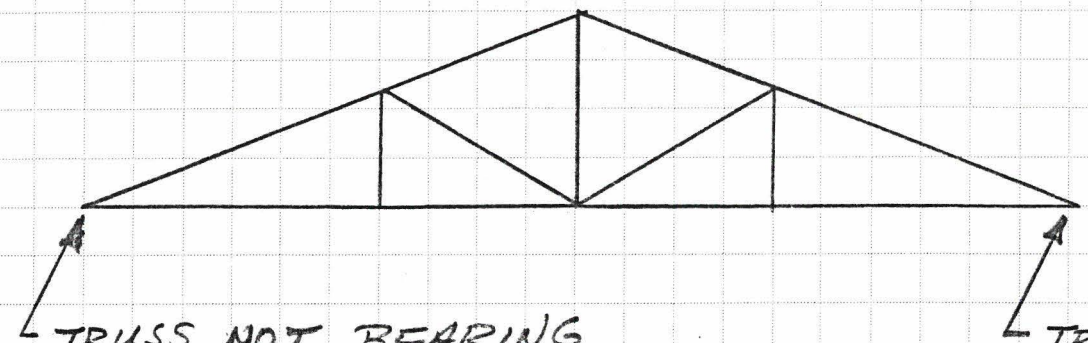
CALCULATED BY WM DATE 4/17/78

CHECKED BY DATE

SCALE

TRUSS RUNNING EAST-WEST ON NORTH SIDE OF DOME

W



TRUSS NOT BEARING BY 1/4" ±

TRUSS NOT BEARING BY 1" ±

1) BOTH COMPRESSION WEBS LOOSE.

2) TIMBER APPEARS TO BE IN GOOD CONDITION.

ROOF AREA SOUTH OF DOME AREA

1) FIRST CROSSBEAM (7¾" x 9½") SOUTH OF DOME ROTTEN

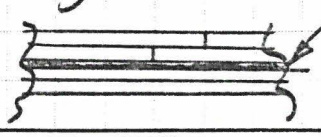
2) SECOND CROSSBEAM HAS INSECT DAMAGE

3) FOURTH CROSS BEAM IS BADLY TWISTED ON WEST END.

4) ALMOST ALL OF THE CROSSBEAMS ARE BADLY CHECKED

5) ROOF SHEETING ON SOUTH END IS ROTTEN DUE TO LEAKS (SMALL AREAS)

6) TRUSSES – a) COMPRESSION WEBS ARE LOOSE
b) TOP CHORDS CHECKED
c) BOTTOM CHORDS ARE CUT WITHIN 1" ± SO THAT ONLY ½ EFFECTIVE



LABORATORY TESTS

1. Two bricks were removed from the lower layer of the foundation at Location (2). These brick were marked A and B. Each of the brick were cut in two. Half of each brick was soaked in water and compression tested. The remaining half was tested at room moisture content. Results are shown in Figures 1 and 2.

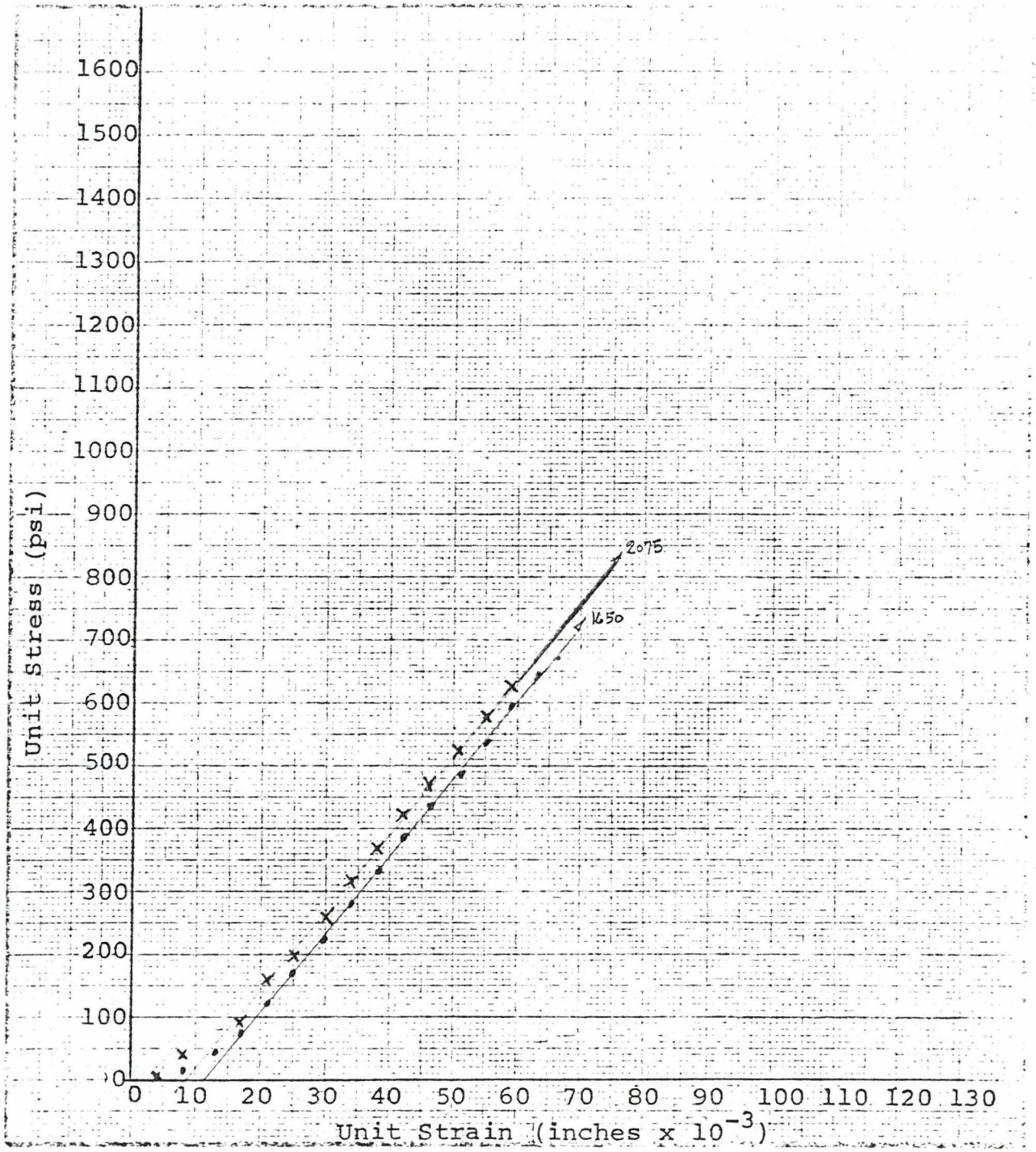
2. A piece of the fireplace located in the snackbar in the basement floor was removed by sawing is out. Portions of two of the brick were labeled D-1 and D-2. D-2 was saturated and compression tested. D-1 was compression tested with moisture at room content. Results are shown in Figure 3.

   Two portions of the sample were trimmed to consist of two half brick with a mortar joint in between. These were labeled E1 and E2. During preparation, sample E2 became cracked along the mortar joint. This was tested with the crack because some of the joints in the structure are cracked also. Both of these samples failed at the lower level than the brick alone. This is to be expected because mortar joints do not give perfect bedding, creating uneven loading and possibly causing tension failure in the brick. The brick in both of these samples apparently failed before the mortar. Test results are shown in Figure 4.

3. A brick was removed from the inside wall footing at Location (8). This brick was sawn in half and labeled C-1 and C-2. C-1 was saturated and tested. C-2 was tested with moisture at room content. Results are shown in Figure 5.

4. Bricks from various parts of the structure were removed and tested. Locations and results are summarized in Table 2.

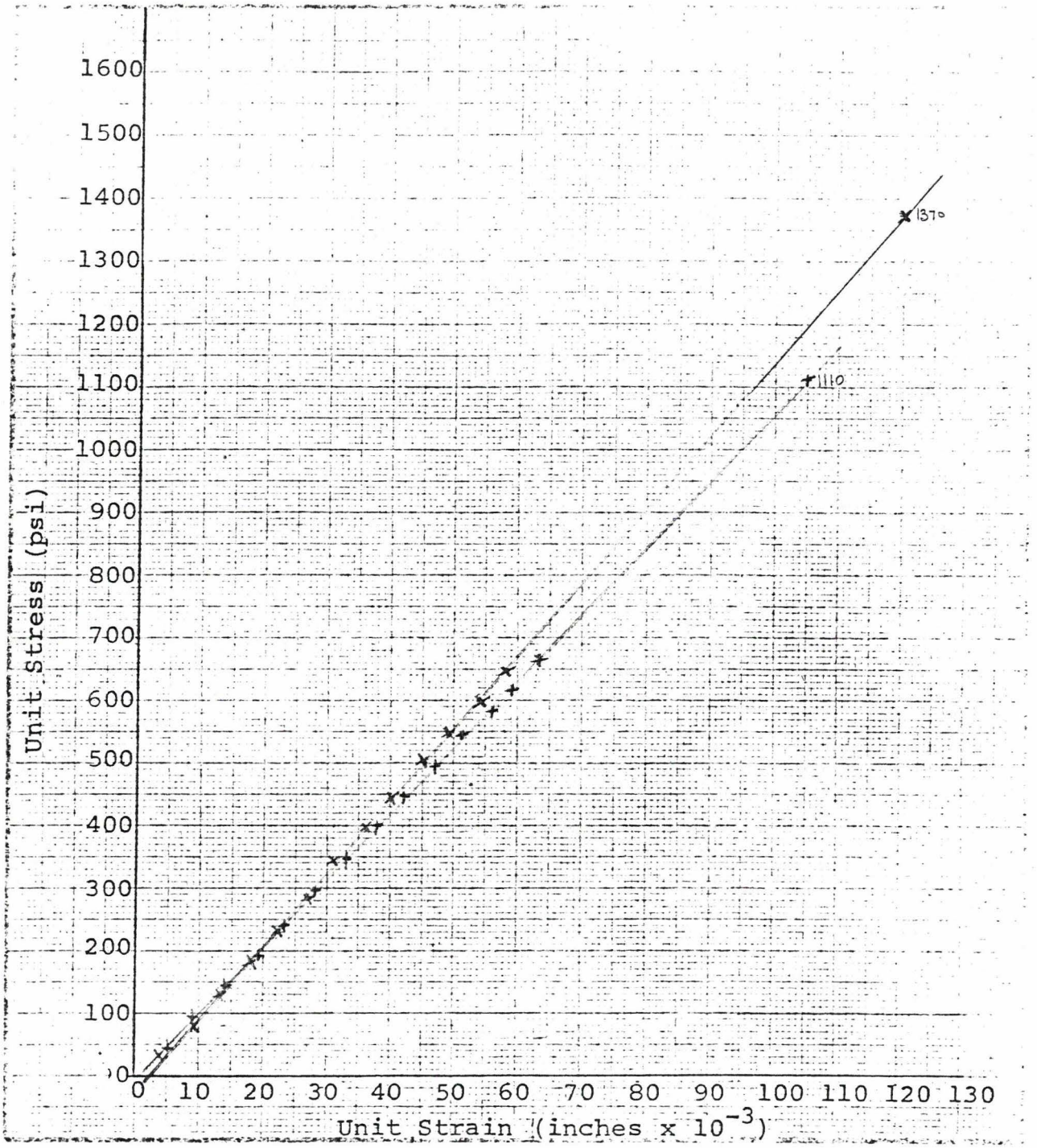
5. Mortar from various places in the structure were trimmed and compression tested. The results may be found in Table 3. Mortar cubes of 3/4 and 1" were used in the compression testing program.



Soaked A-1 x E = 12,300

Unsoaked A-2 • E = 12,440

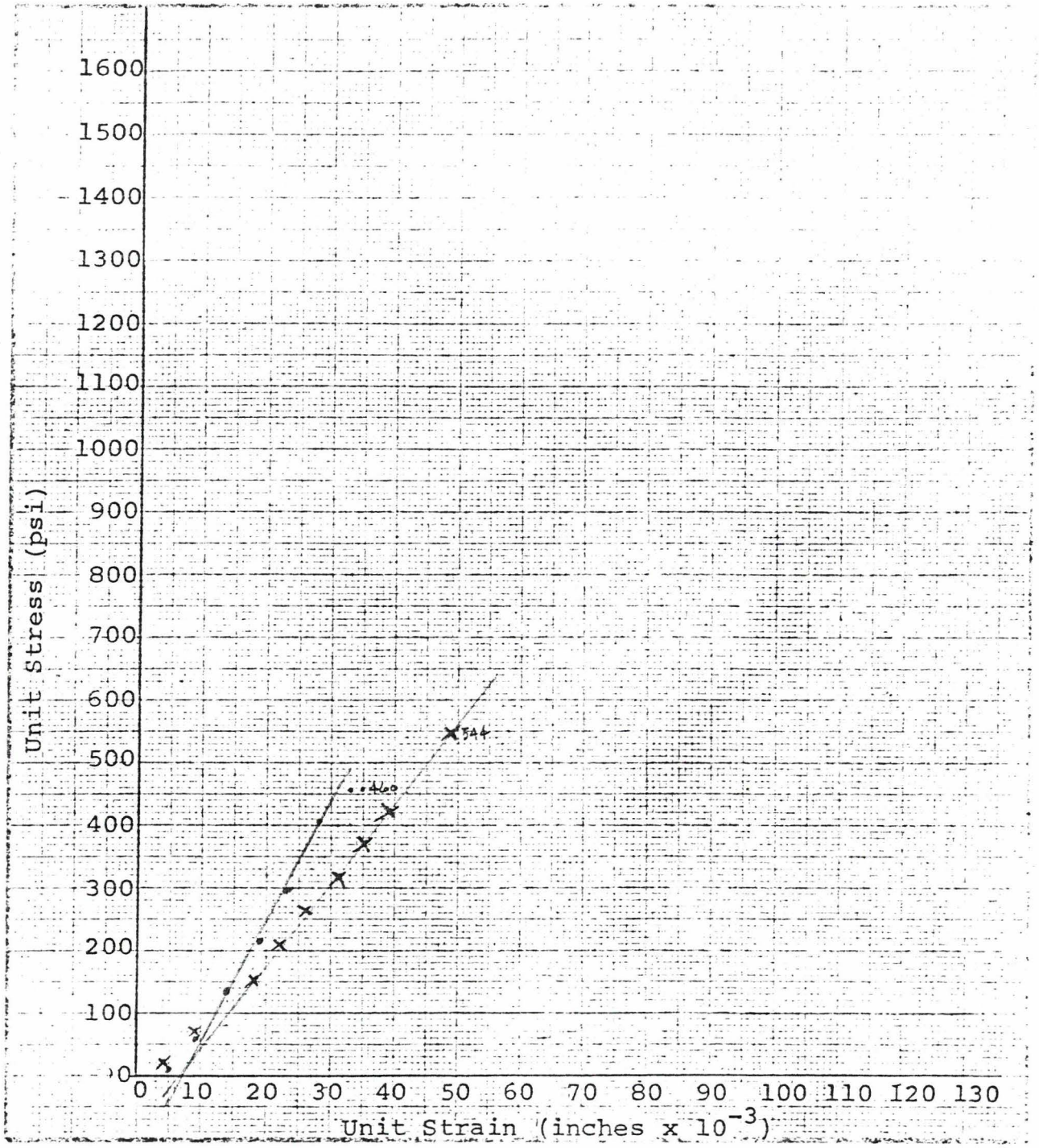
FIGURE 1



Soaked B-1 x E = 11,820

Unsoaked B-2 + E = 10,690

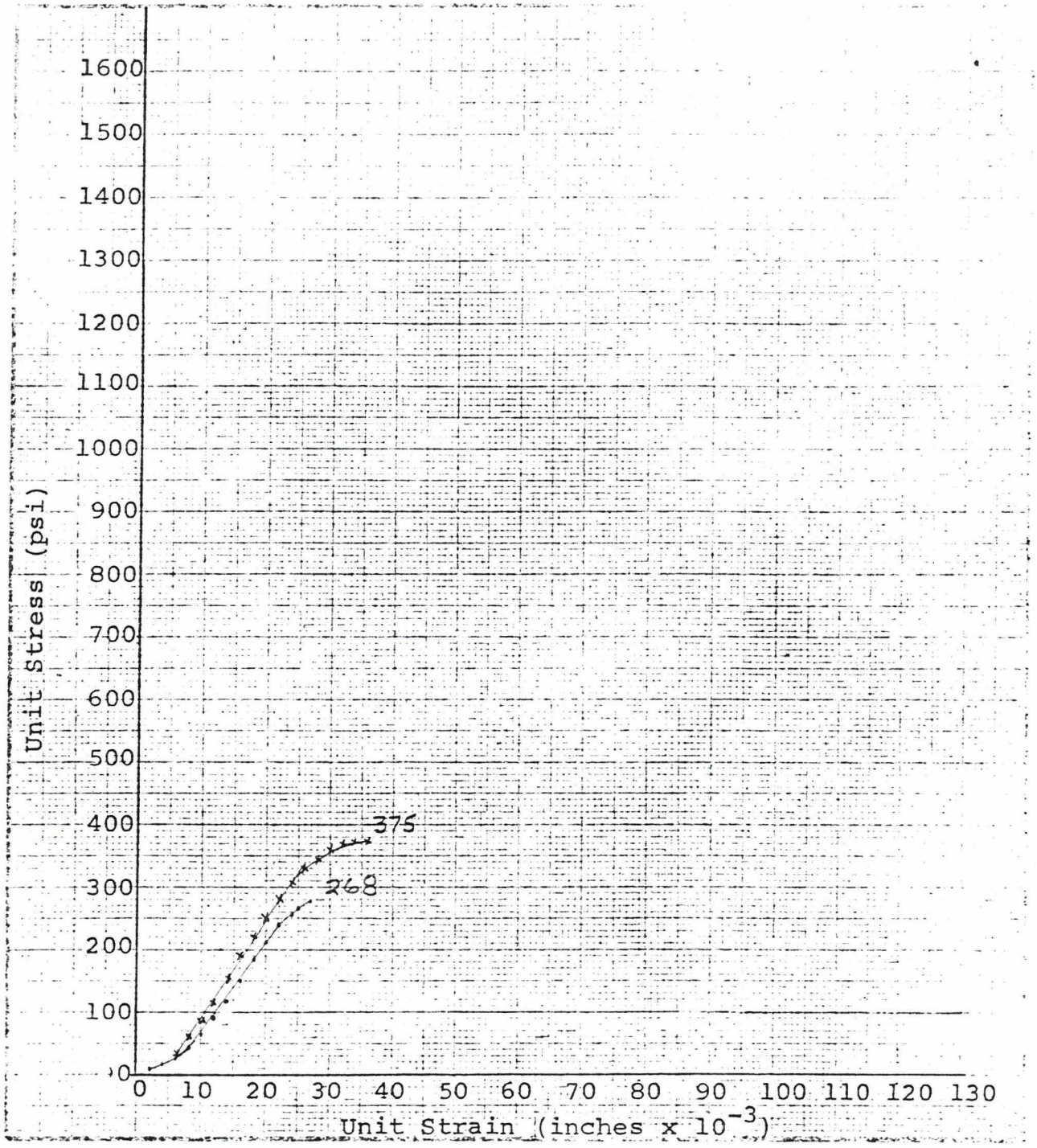
FIGURE 2



Unsoaked D-1 x E= 13,230

Soaked D-2 • E = 19,370

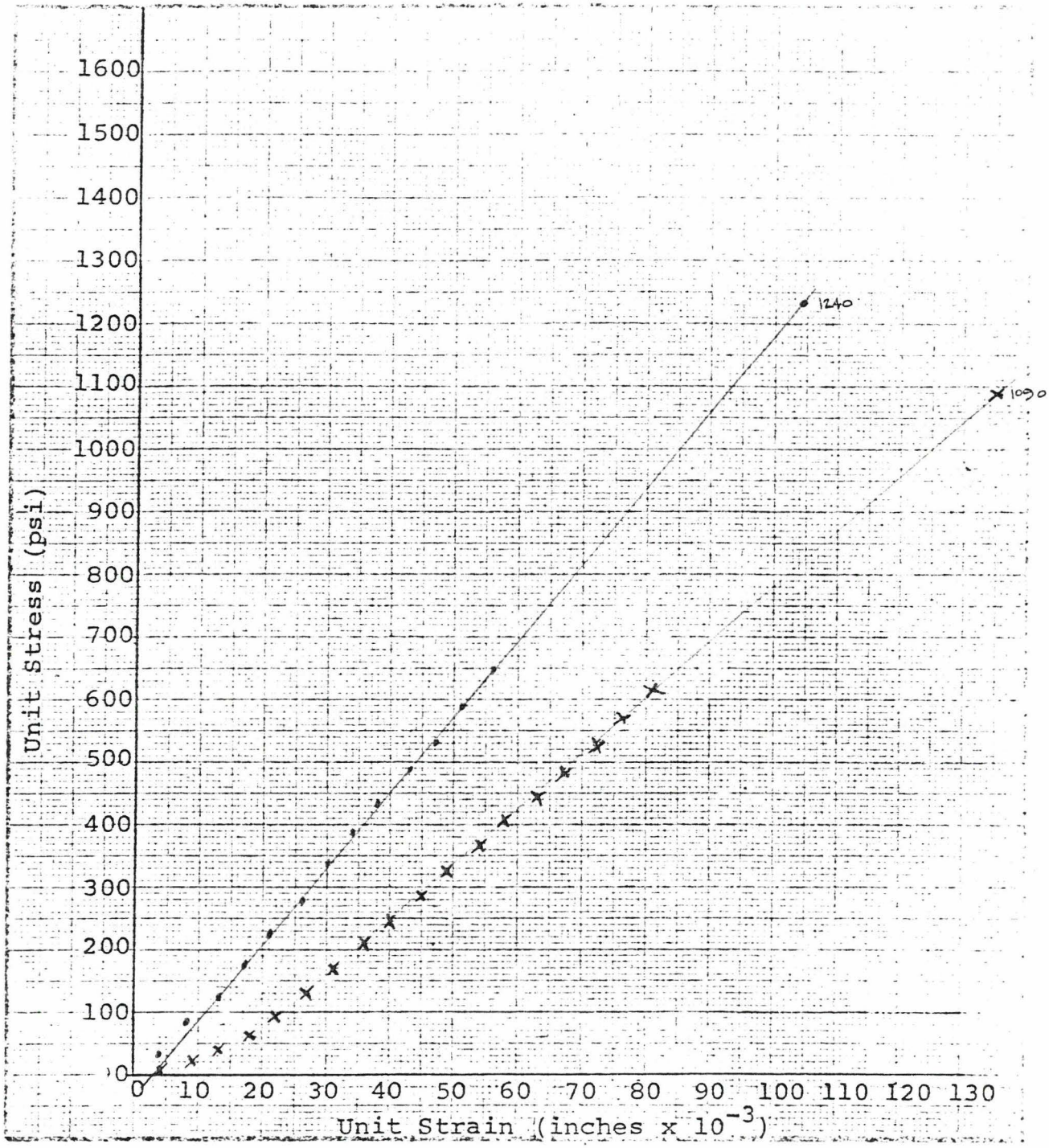
FIGURE 3



E-1 • E = 13,750

E-2 × E = 16,660

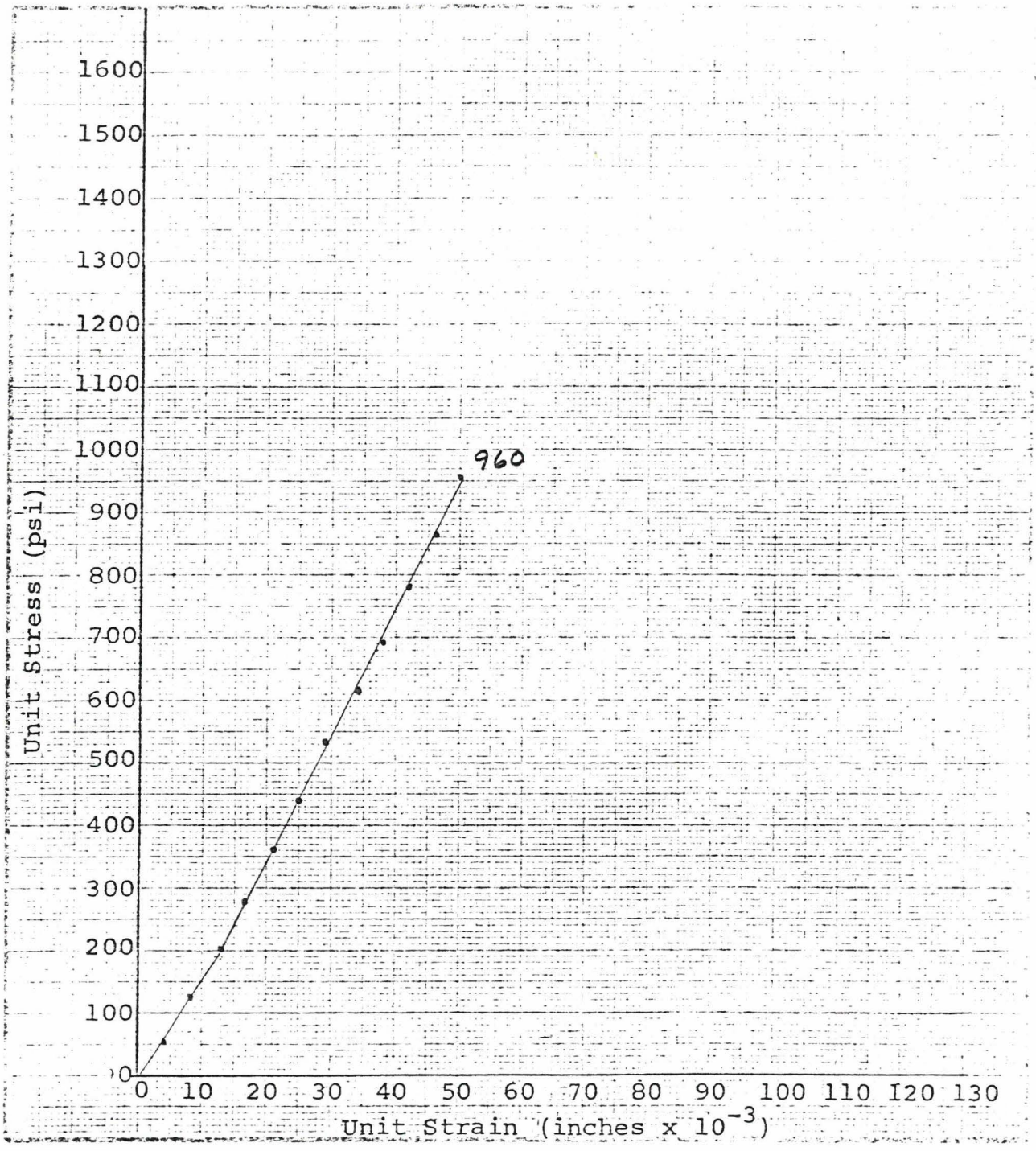
FIGURE 4



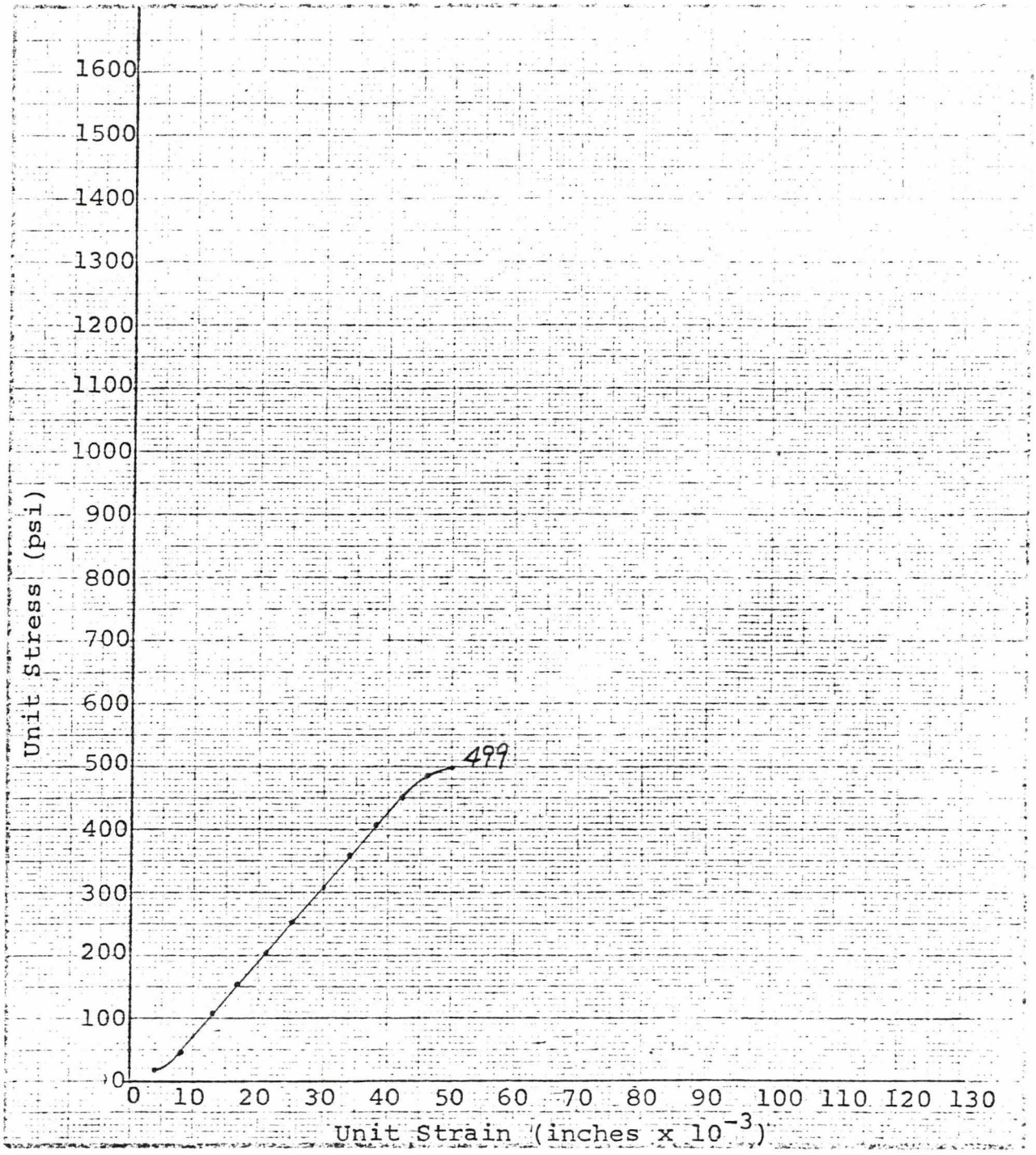
Soaked C-1 x E=8,760

Unsoaked C-2 • E=12,260

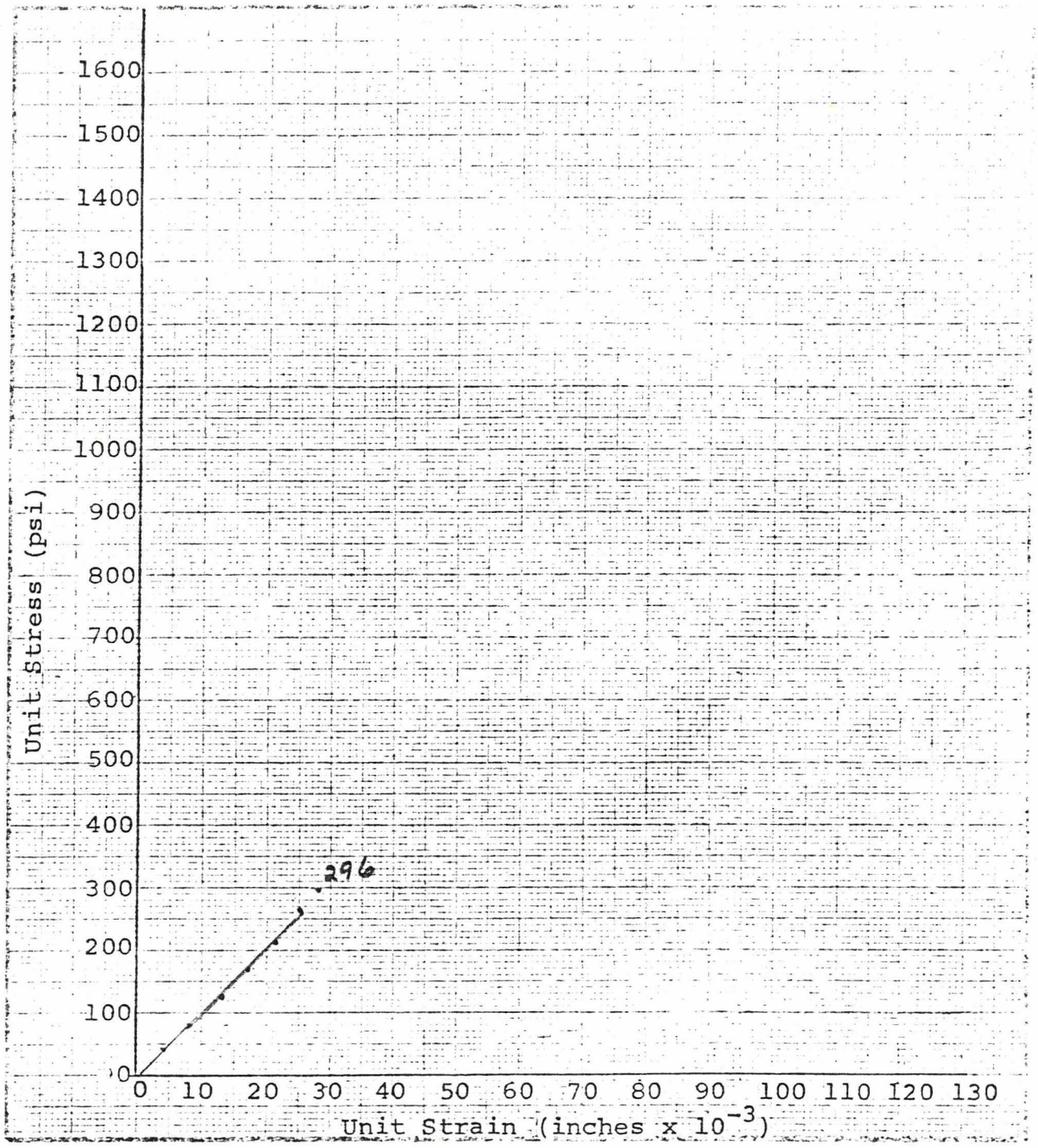
FIGURE 5



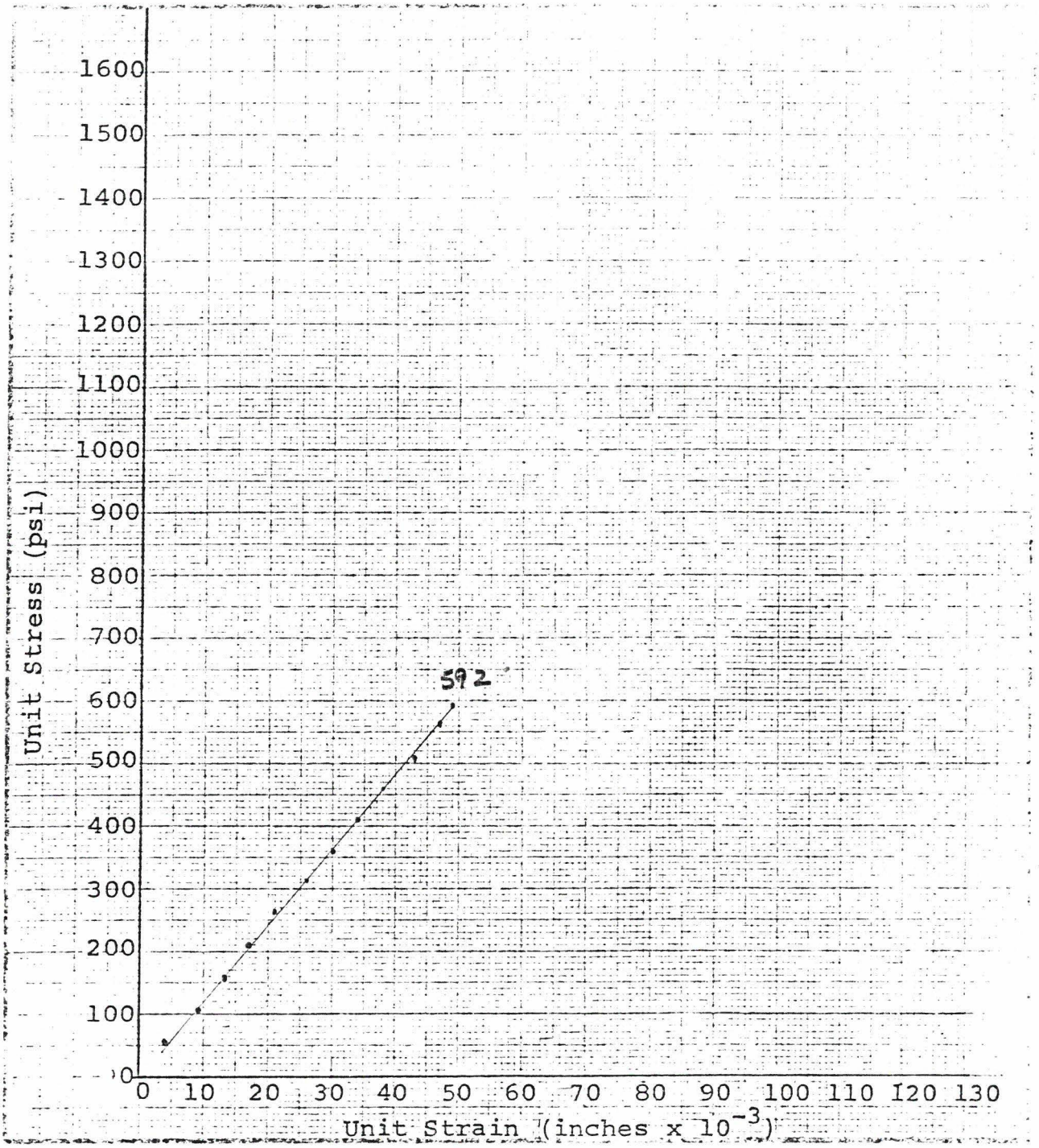
Sample #1 (Natural Moisture).



Sample 02 (Natural Moisture)



Sample OA (Natural Moisture).



IA (Natural Moisture)

I BASEMENT (Ground Floor)

A. Exterior Excavation

1. Excavated at N.W. corner of center section at exterior wall of 1845 building and 1922 addition.

a.) 1922 addition - mortar and brick in good condition resting on 12" concrete footing.

b.) 1845 building - mortar very soft and moist, east to remove, brick resting on the earth with 4'± wide base corbeled to outside wall. Brick in fair condition.

2. Excavated at the N.E. corner of center section at exterior wall of 1845 building and 1922 addition.

a.) 1922 addition - mortar and brick in good condition resting on 12" concrete footing.

b.) 1845 building - mortar very soft and wet. Brick in fair condition. (Brick was removed by scraping mortar away with knife.) Brick corbeling resting on earth.

c.) Downspout at location had a clay pipe 90° bend with the bottom broken out allowing the water from roof to get to the footing and keep it damp.

3. Excavation at N.E. corner of 1845 building and the south wall of the 1902 addition.

a.) 1902 addition - Brick and mortar in fair condition all resting on 12" concrete footing. Concrete footing did not appear to be in as good condition as 1922 addition concrete. The brick wall was not corbeled. The footing varied in width from 3" to 12" wider than the wall.

b.) The 1845 building footing was the same as A.1.b.

B. Interior Excavation

1. Excavation in old Snak Bar east wall of 1845 building

a.) Removed 4" wood framed floor

b.) Removed 2" - 4" terrazzo tile floor laid over broken brick and mortar.

c.) Removed old brick flooring about the age brick of the 1845 building.

d.) Excavated footing and found the following:

1. Mortar soft, brick in fair condition with corbeling down to rest on the earth. Footing was 4.0'± wide.

e.) Brick fireplace rest on top of terrazzo flooring with no footing.

2. Excavation in old Snak Bar north side of north wall of the center section of the 1845 building.

a.) Remove 4" terrazzo floor laid over broken brick and mortar laid over 2" - 4" sand.

b.) Removed old brick flooring.

c.) Excavated footing around chimney foundation. Brick in fair condition. Mortar soft with corbeling 20½ inches out from the face brick.

3. Excavation in same open as B-2.

a.) Excavated footing at interbearing wall 1845 building on the east side of the east wall north of center section, the brick and mortar in fair condition with corbeling 4½" out from face of brick wall. The mortar in this area was not as damp as the outside walls.

4. Excavation in old Snak Bar at the south side of north wall of center section of 1845 building on east side.

a.) Removed concrete 4" concrete floor.

b.) Excavated footing at chimney. Corbeling at footing extends 5½"

to 7½" out from chimney wall.

c.) Brick and mortar found to be in fair condition.

C. Openings in Ceiling to Examine First Floor Framing

1. Opened side of beam cover to find steel beam as shown on 1922 addition; this located at west wall of 1845 building, good condition.

a.) Box around framed.

2. Exposed bottom of first floor joist found in good condition.

a.) 3x12 @ 15" oc running N. and S.

b.) Ceiling of basement metal lath with plaster in center section.

3. Exposed joist at steel beam running E. and W. found in good condition.

a.) 3x12 @ 15" oc running N. and S.

b.) Ceiling of metal lath with plaster.

4. Exposed steel beam running E. and W. which was added in 1922.

5. Brick arch which supports upper floor joist partly removed to allow pipe to go through.

6. Exposed joist on south side of brick arch found joist fire cut into arch and in good condition.

a.) 3x12 @ 15" oc running N. and S.

7. Exposed joist on north side of brick arch found joist in good condition.

a.) 3x12 @ 15" oc fire cut and bearing on east interior wall, joist running E. and W.

8. Exposed joist at east exterior wall in corner of frame wall.

a.) Joist was 3x12 @ 15" oc running E. and W.

b.) Fire cut into exterior wall.

c.) Evidence of termites from frame wall but no penetration into joist.

9. Exposed joist on south side inter wall on north wall of center section.

a.) 3x12 @ 15" oc running N. and S. in good condition.

10. Exposed joist @ S. end of 1845 in hall.

a.) 3x12 @ 15" oc fire cut and bearing on interior wall running E. and W. in good condition.

11. Exposed joist and beam in 1902 addition south section.

a.) 7x20 I beam believed to be steel with splices changing it to 7x14 over col.

b.) Joist 3x14 running N. and S. in good condition.

12. Exposed what was thought to be a beam at the north building line of the 1845 building but was some type fake beam or an air plentium.

II First Floor

A. Investigation of First Floor

1. Hole in broom closet ceiling used to gain access to second floor framing under bath room.

a.) Water stain and rot in ceiling over service sink in broom closet.

b.) 3x14 @ 14" oc running E. and W. fire cut into exterior and inter brick walls good condition. No evidence of water.

c.) Ceiling of first floor bath suspended metal lath with plaster for plumbing pipes.

2. Crack in north wall at beam above running E. and W.

a.) Crack from floor to ceiling at wall type change from brick to frame with plaster.

III Second Floor

A. Opening of Floor for Examination of Second Floor Framing

1. Opening in center section on east side at south wall.

a.) Removed 2x tongue and groove decking 1x decking, good condition.

b.) 3x12 @ 15" oc running N. and S. good condition

c.) Steel I beam as per 1922 plans was visible from this point running E. and W.

2. Opening in Room 13 which was 1845 meeting hall.

a.) 3x14 @ 16" oc running N. and S. fire cut into brick wall.

B. Investigation of Second Floor

1. Crack from ceiling to floor in S.W. corner of center section.

2. Crack in wall where floor framing changes from E. & W. to N. & S. Wall appears to set on top of flooring and not to continue down to wall below.

3. Leak from roof has caused flaking of paint at ceiling but no apparent damage below this point.
4. 0.3 of a foot sag in ceiling where columns were removed.

INVESTIGATION PROCEDURE:

First attempts were made to locate existing plans which are of the 1923, 1936 and 1946 additions plus some remodeling plans.

The 1845 and 1902 portions were field measured to determine as closely as possible the existing structural conditions. Plan sheets prepared are: (1) (2)...

Structural inspections were started in the basement and proceded upward to the roof with special attention being focused on the dome rotunda and rotunda support structure.

1845 FOUNDATIONS: The 1845 foundations were brick seated on sandy clay. The face brick are a hard burned brick which appears to still be hard and quite serviceable. Core brick are a much softer brick which appeared to break easily. However, laboratory tests indicate the brick strength to be about 268 psi. While this strength is not comparable to current masonry requirements, it appears sufficient for the present use (if kept confined).

The mortar used is very soft, so soft it can be dug out using one's fingers. This mortar has a strength of about 48 which will determine the ultimate strength of the wall.

1845 WALLS: The walls above grade have a hard burned brick which still appears to be sound. However, many pits are obvious in the exterior wall. The same soft brick were used in the core of the wall, however, where dry appeared to be somewhat stronger than moist brick.

All undisturbed walls appear to be relatively sound.

Parts of the 1845 capitol have been modified so it is difficult in many places to determine the age of walls and conditions due to internal wall covering. The only major crack is in the west wall in a northerly fireplace. The wall is only one brick thick, a void, a firebrick, a void, the 2 bricks in the fireplace.

1845 FLOORS: The 1845 floors are supported on 3x14 joists at 16" o/c. Such a floor system would support a live load of about 100 pounds per square foot. The subflooring is 1x lumber with pine flooring. The condition of the flooring is difficult to determine since virtually all is covered.

The framing of the building is to fire cut the joists into the walls. Such construction allows a moisture build-up within the wall at low temperatures.

Since it is virtually impossible to check all timber in the wall, random checks were made. These indicate that all existing joists must be checked for dry rot prior to reuse. However, most joists are sound.

WOOD PARTITIONS: The wood walls have suffered even more remodeling than brick walls. Thus it is impossible in many cases to determine the age of walls.

ATTIC, ROOF SUPPORT TRUSSES AND ROOF DECK: The roof support system and the roof are treated as a system since a series of problems are present and all interrelated. The problem is water. Roof leaks must have started shortly after the original building was constructed and are continuing.

It has not been possible to verify the original roof, although it appears slate was used. Early photos and references indicate a slate roof. The roof support members are rather large which also indicates a heavy roof.

The structural system is trusses spanning between exterior walls with purlins on the trusses and a board deck. Ceiling joists were attached to the bottom truss member which supported the ceiling. Two types of ceiling were observed, pine and plaster. The conditions observed in the roof vary from excellent conditions to no member. Some members have totally disintegrated so completely only holes in which they once fit can attest to their existence.

Many members have been repaired or show where repair attempts were made. Other structural members have had major parts removed when utilities were installed.

Major parts of the roof deck have been replaced with plywood of recent origin.

ROTUNDA SUPPORT: The rotunda and dome appear to be areas in which a great deal of remodeling has occurred.

Until 1923, a stairwell went from the basement to the second floor in the west side of this area. When the dome was built in 1902, a hole was in the center of the area allowing a view of the inner dome from the first floor.(?)

The dome was supported by four columns. During the 1902 remodeling, north-south trusses were installed to support the dome. These trusses bear on the tops of 4 fire places which were covered by timbers. The fireplaces have not been filled or modified to carry such a load, nor is there any structural reinforcement.

NOTES RE CAPITOL

Building Built in pahses with several remodeling and rennovations;

Original	1845
Rebuilt	1889
Addition	1902
Addition	1923
Addition	1936
Addition	1946

Type of Construction (Structure)

Foundations	Brick	Concrete	Concrete	Re-Concrete	Re-Concrete
Walls	Brick	Brick	Brick	Re-Concrete	Re-Concrete
Basement Floor	Brick	Concrete	Concrete	Concrete	Concrete
Part Basement	Brick	Brick	Brick	Concrete(1)	Concrete (1)
1st Floor	Timber	Timber	Timber	Re-Concrete	Re-Concrete
Flooring	Wood	Wood	Wood	N/A	N/A
Part	Brick	Brick	Brick & Stud	Re-Concrete(1)	Re-Concrete(1)
2nd Floor	Timber	Timber	Timber	Re-Concrete	Re-Concrete
Flooring	Wood	Wood	Wood(2)	N/A	N/A
Part	Stud	Stud(?)	Stud	Re-Concrete(1)	Re-Concrete(1)
Ceiling	Pine	Plaster	Metal	N/A	N/A
Roof Support	Wood Truss	Wood Truss	Wood Truss	Steel	Steel
Deck	Planks	Planks	Planks		
Roofing	Roll	Roll	Roll	Roll	Roll
Dome		Frame			
Supports		Wood Truss			
Cover		Metal			

(1) Structural Partitions others Plaster Walls

(2) Marbeloid Surface

CONTINUING RESEARCH

I. State Fire Marshal

A. The Guide Book used by them is the Life Safety Code.

1. The list of deficiencies of the entire capitol was given to us with a second list of the corrections that was made.

II. City Building Inspector

A. One hour fire separation between floors and party walls.

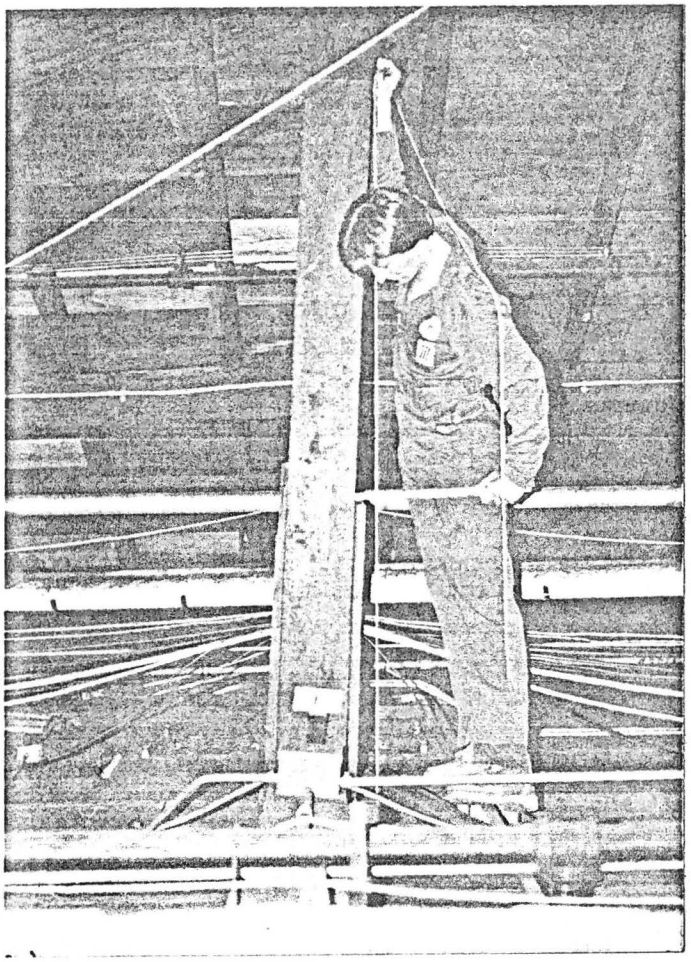
B. Dead end corridors (or halls) no longer than 20'.

C. One hour fire doors

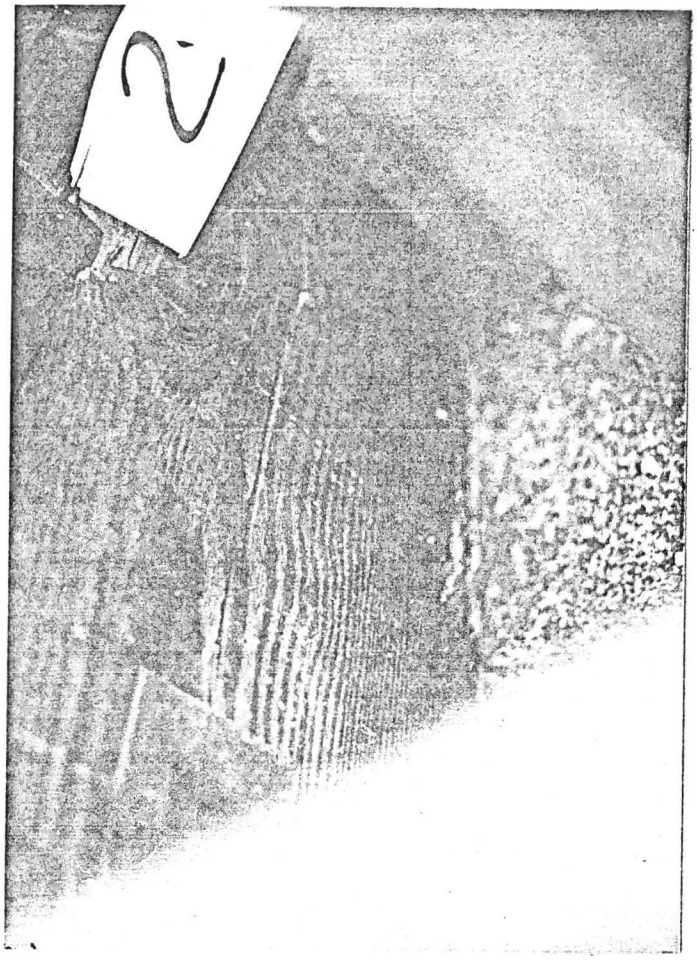
D. No glass over the doors

E. Open stairs may be permitted with only 3 flights of stairs.

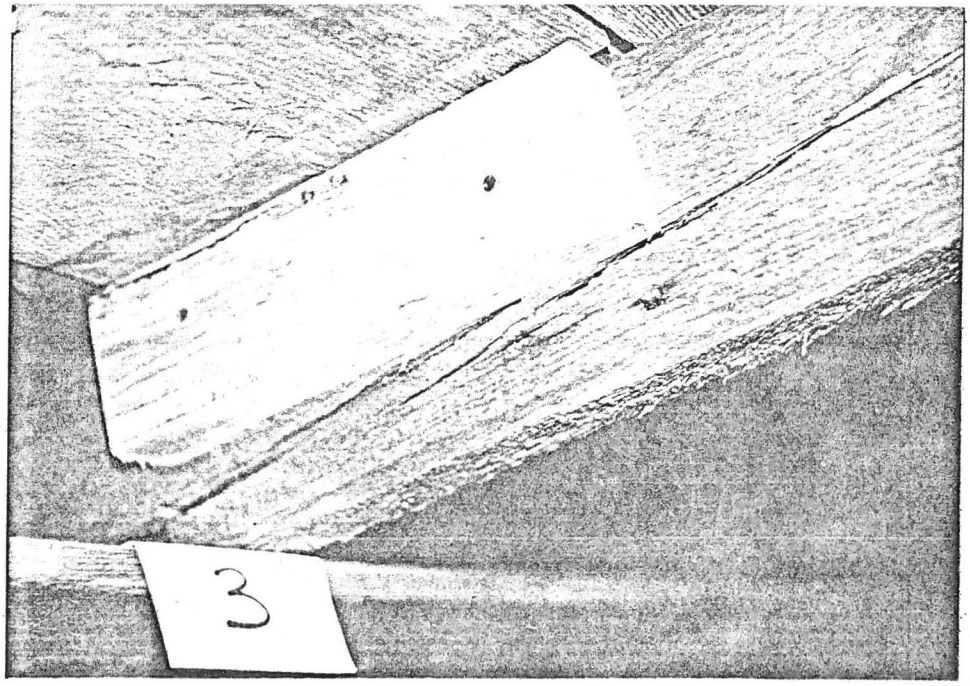
III. Open and inspect chimney in bath on second floor (S.W. Chimney).



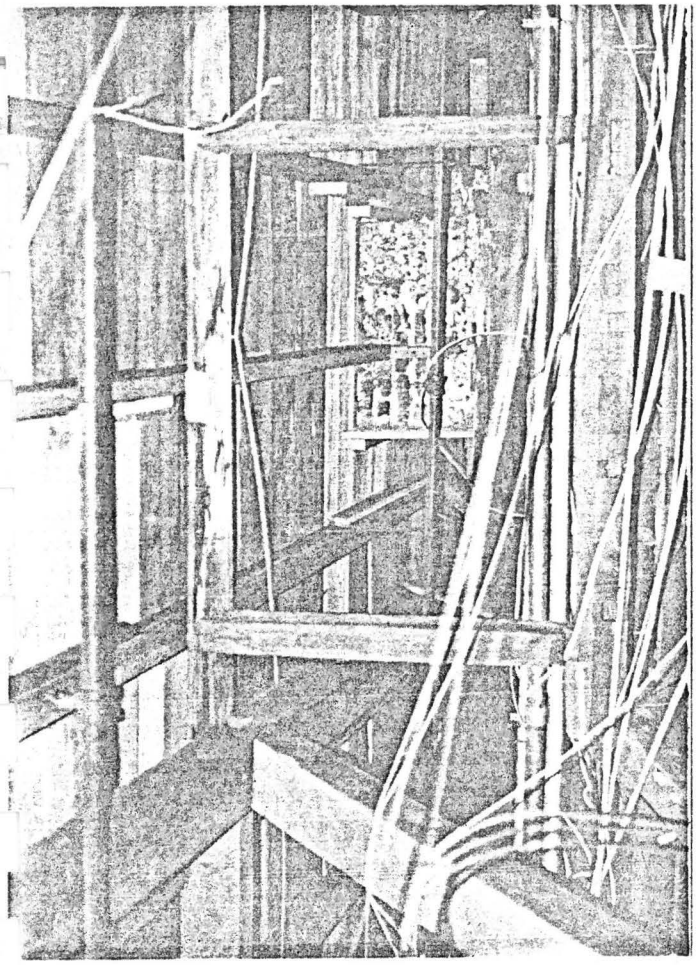
1. Frame N_1 support column leaning N $\pm$ 2"



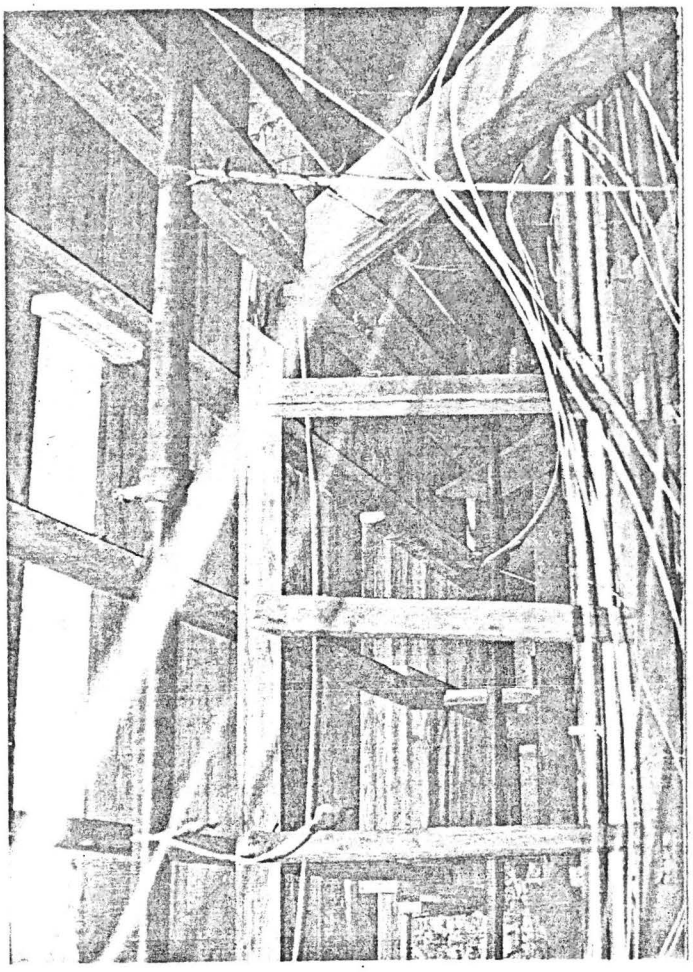
2. Termite zone E-side sloping member



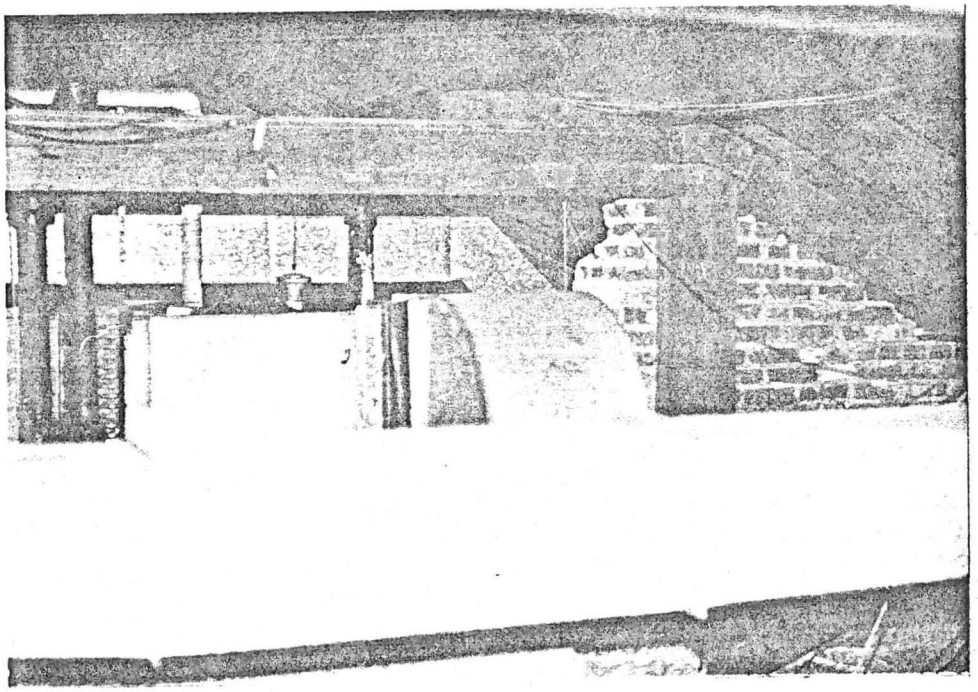
3^1 Roof sloping member badly cracked



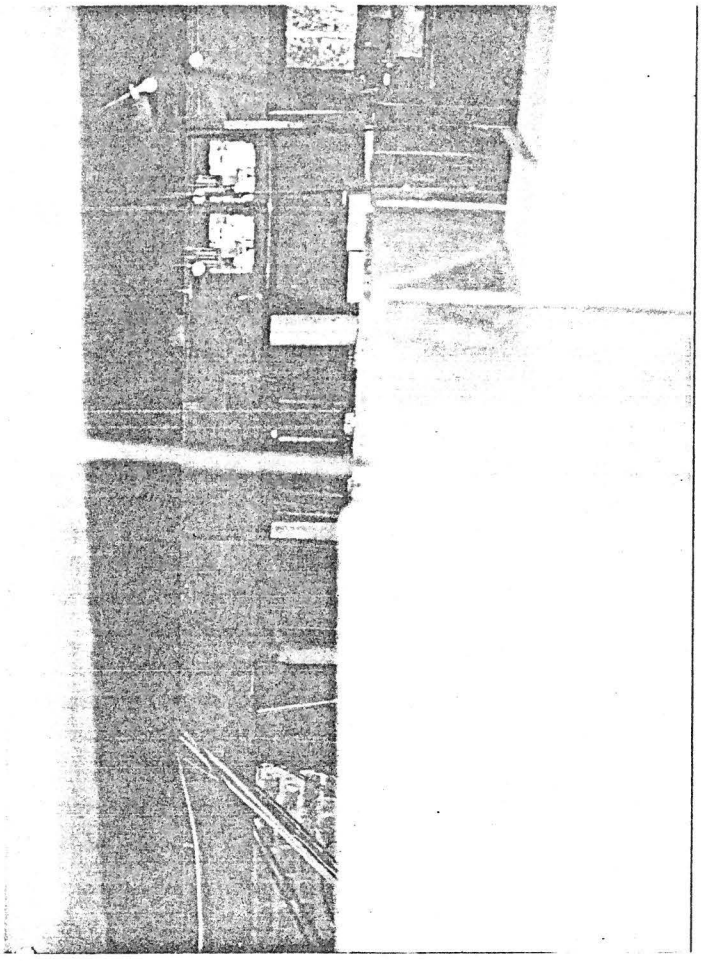
3^2 Replaced purlin between N_2 & N_3



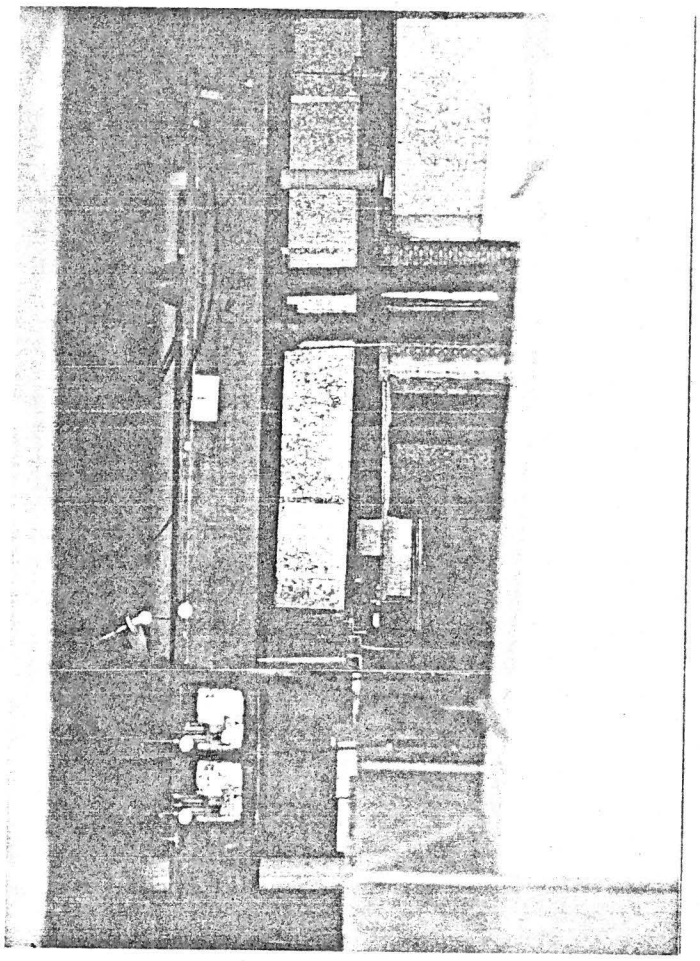
3^3 Replaced purlin between N_2 & N_3



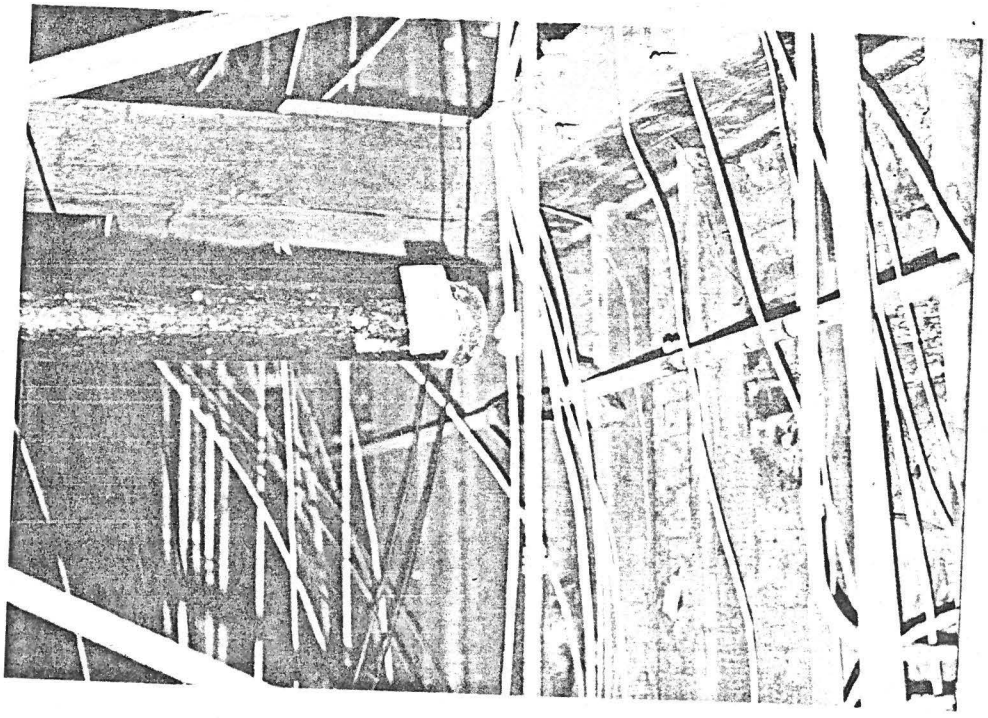
4^1 Looking N on 1845 wall



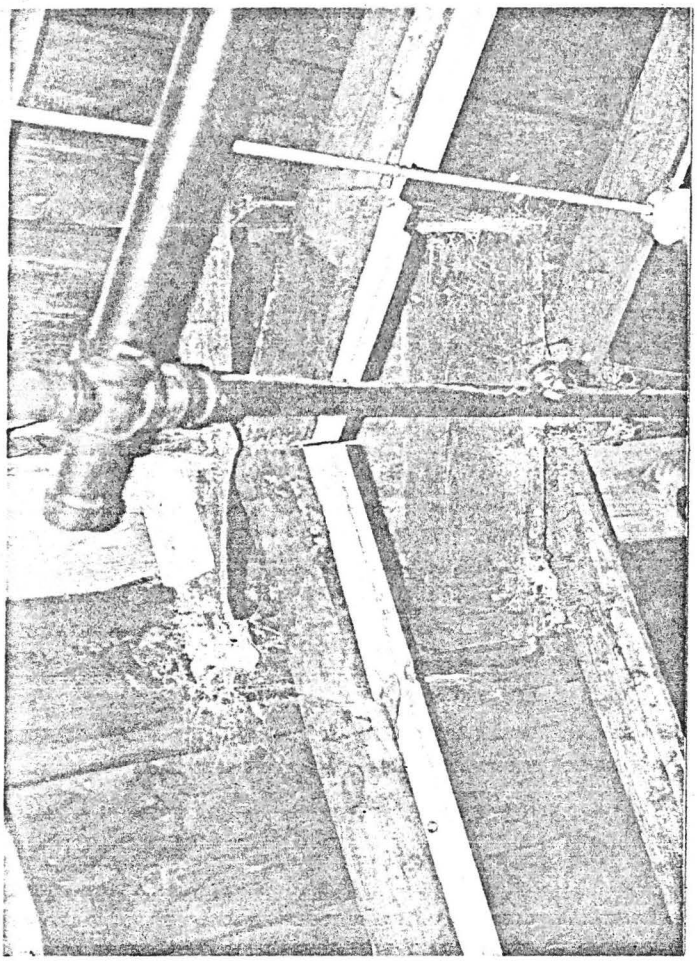
4^2 Looking N on 1845 wall



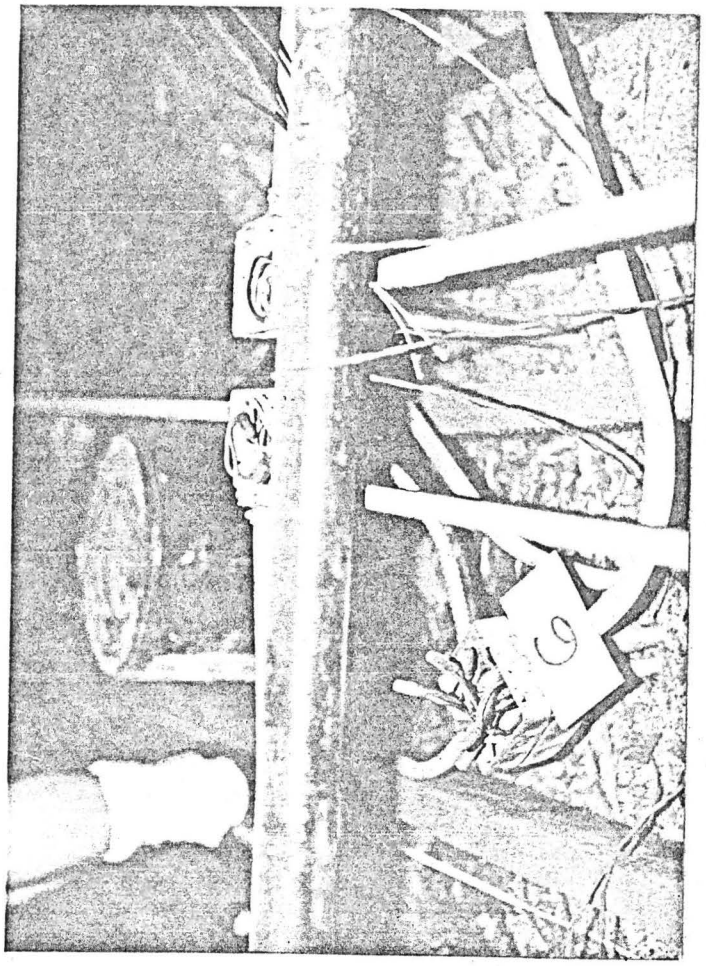
4^3 Looking N on 1845 wall



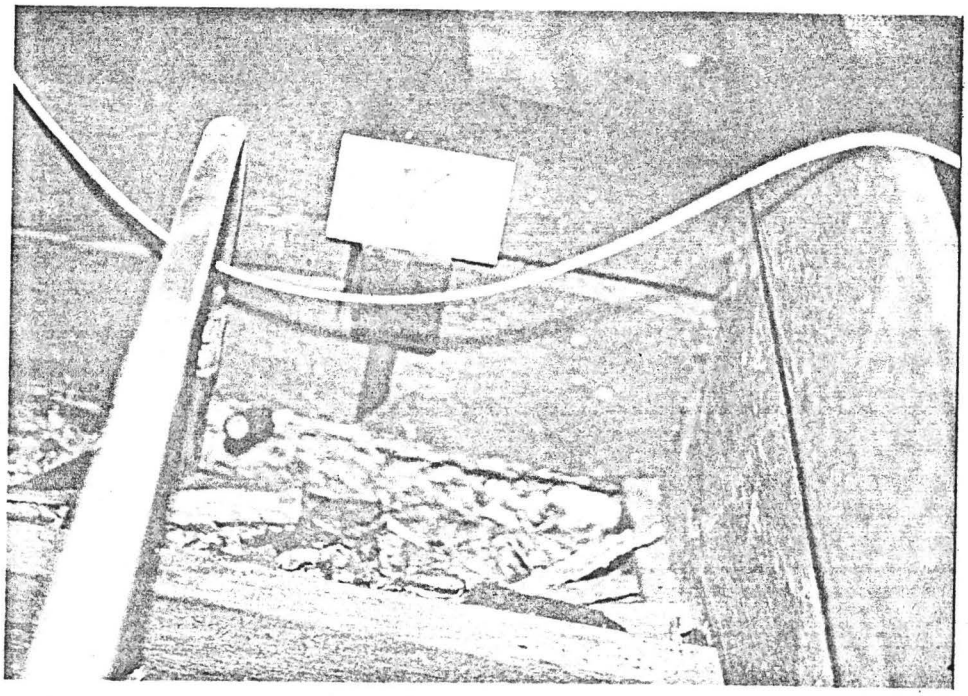
5. Wet zone at discontinued vent pipe



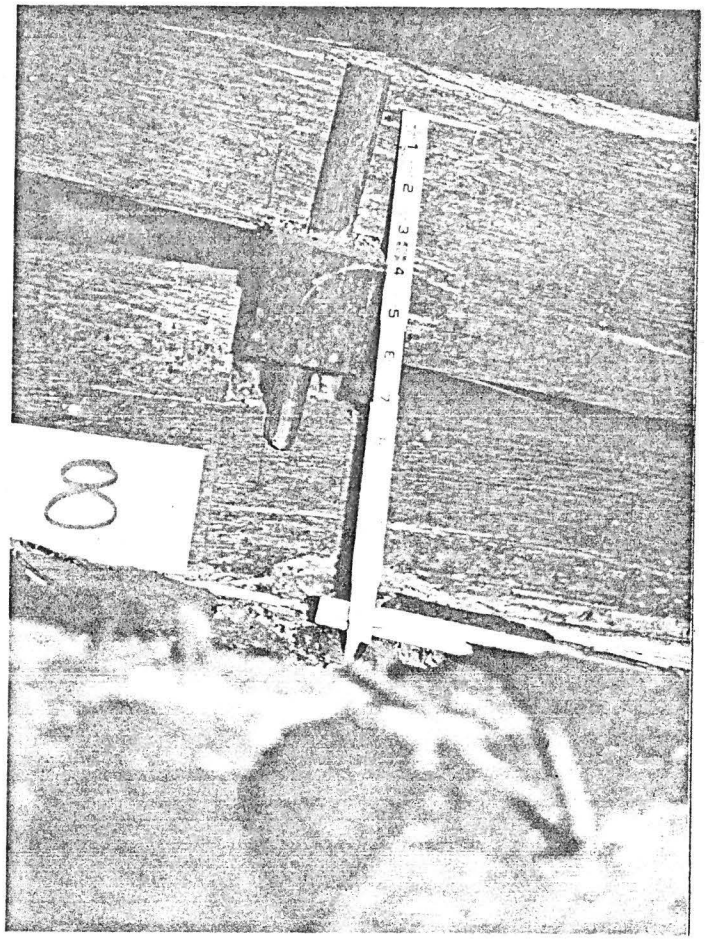
Roof rafter at ridge cut through



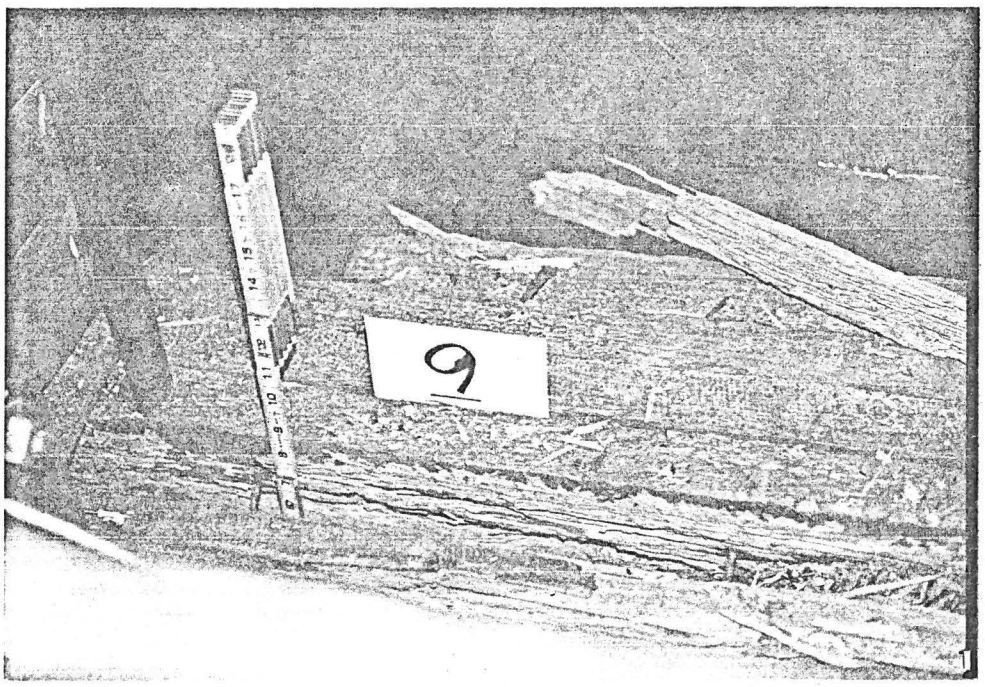
6. Electricity connections not covered



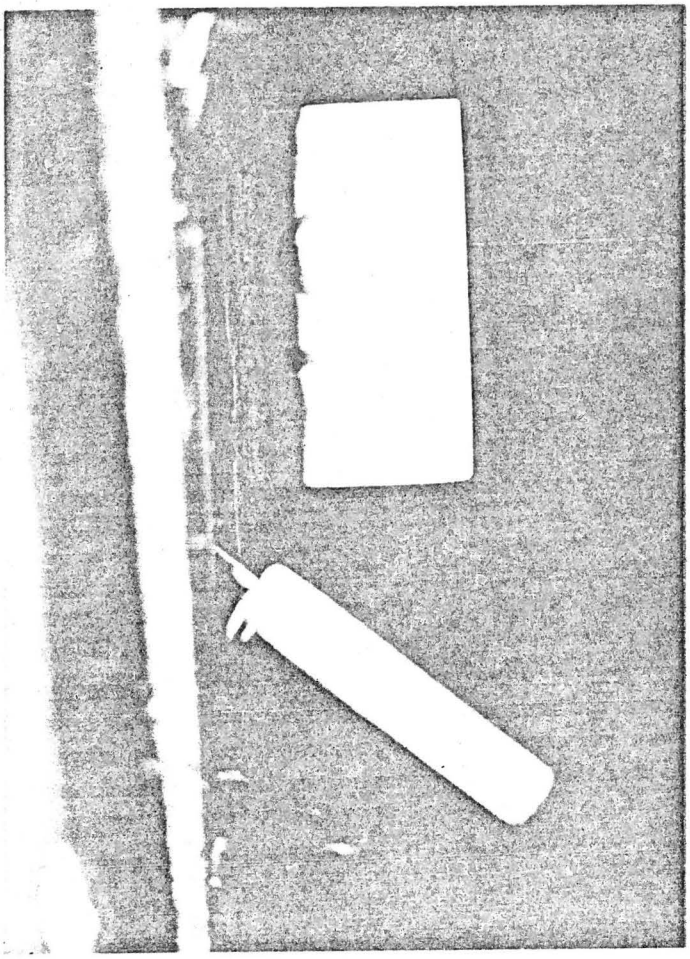
7. Wood rot near eaves



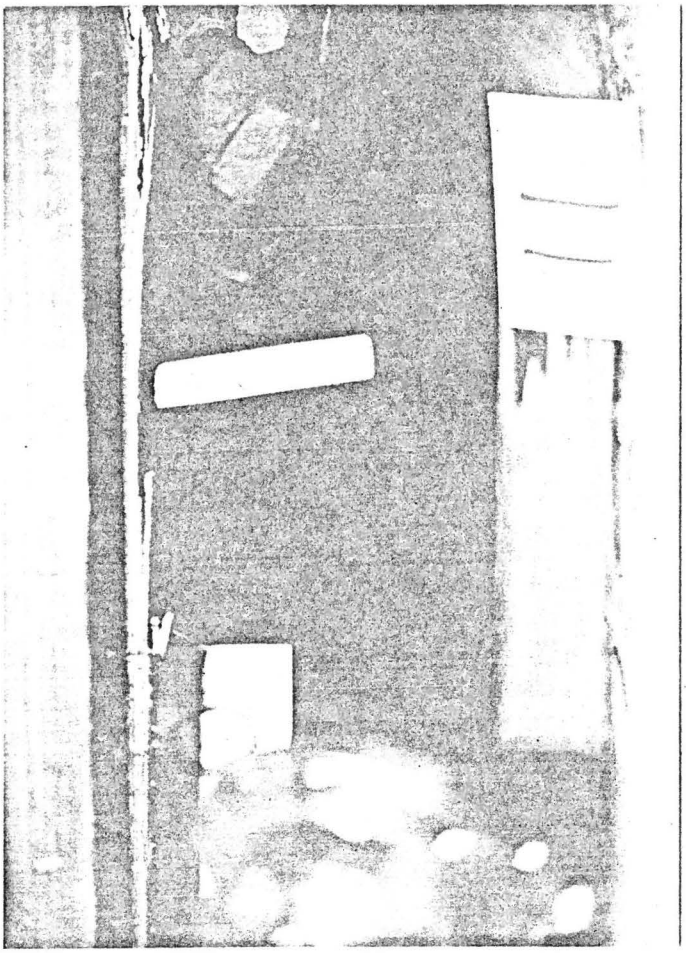
8. Wood rot near eaves



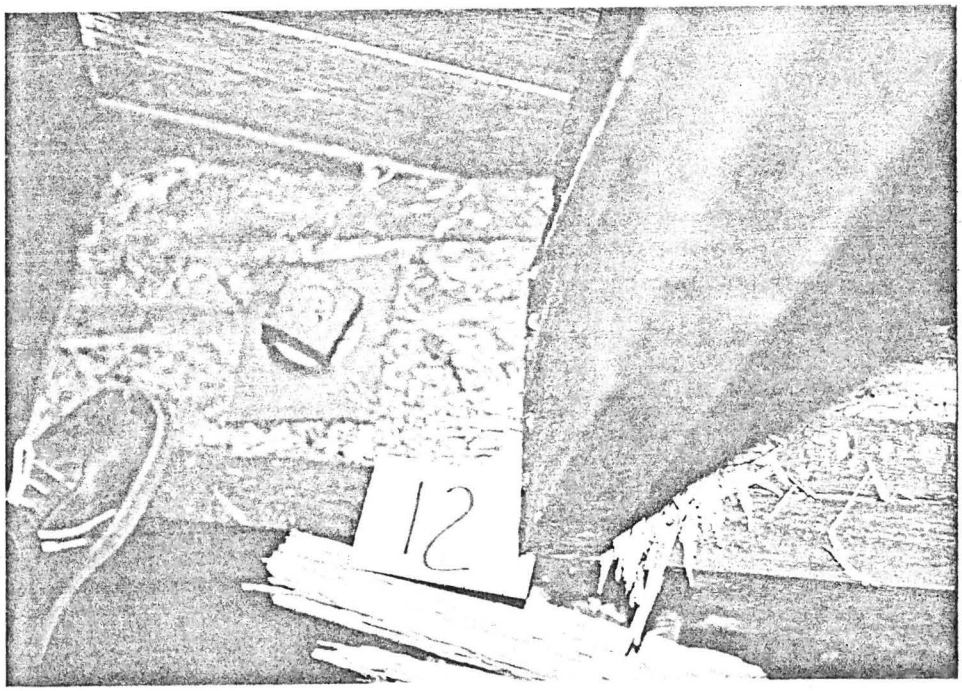
9. W-Truss - top side bot chord - termite damage



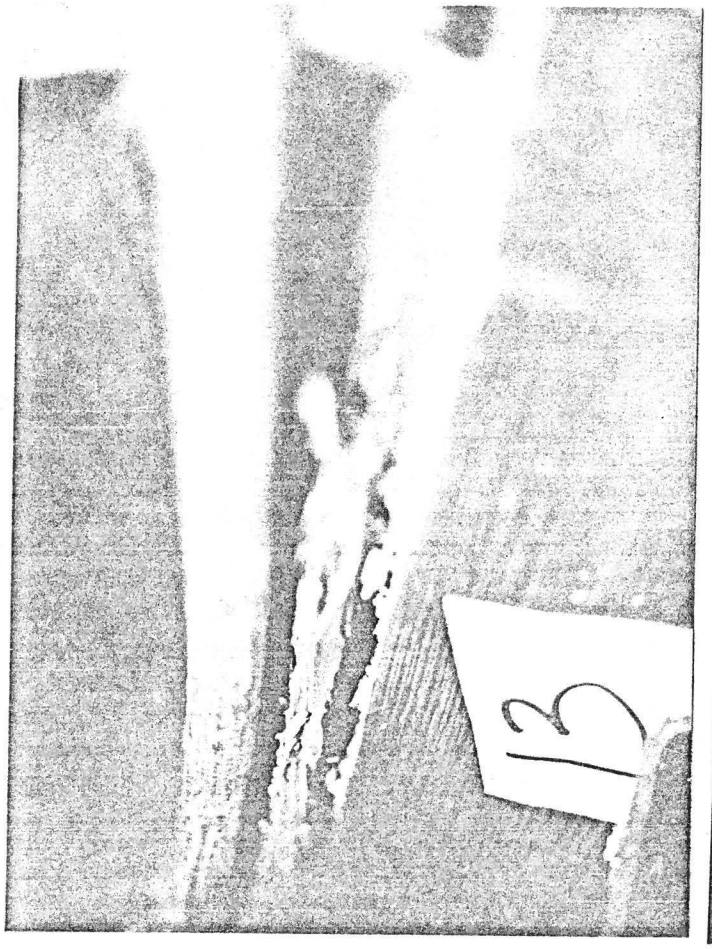
10. W-Truss - bot side bot chord - termite damage



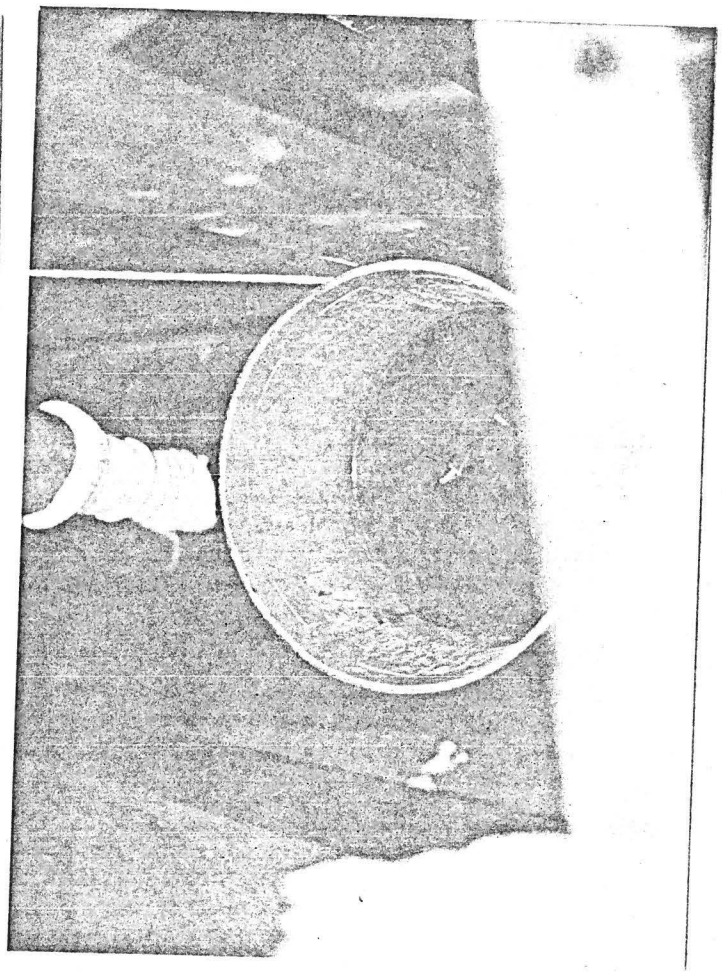
11. W-Truss - bot side bot chord - termite damage



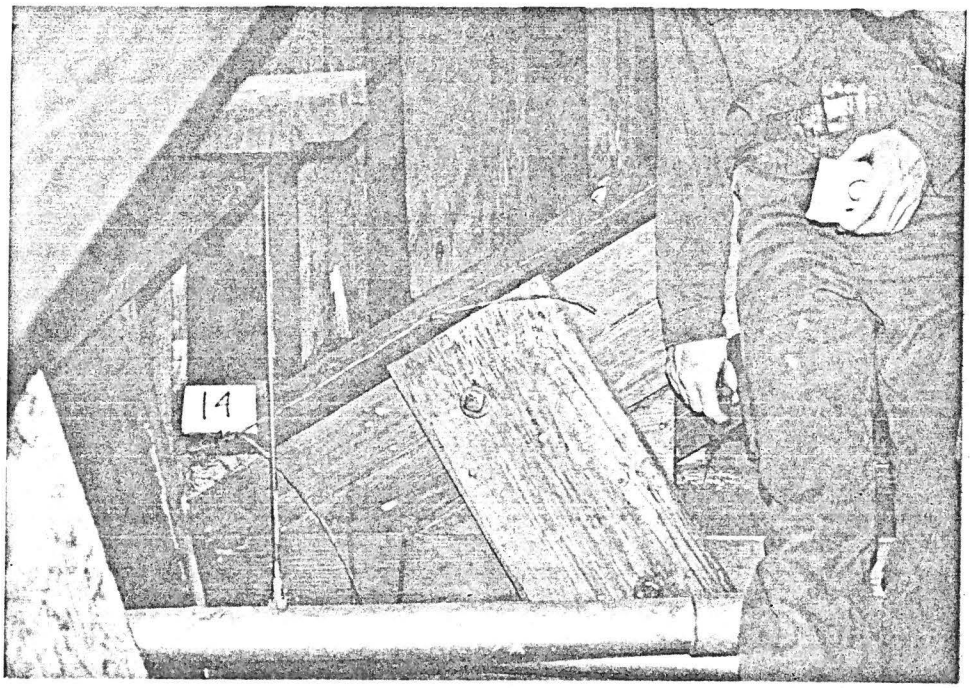
12. W-Truss - top of diagonal chord - termite damage



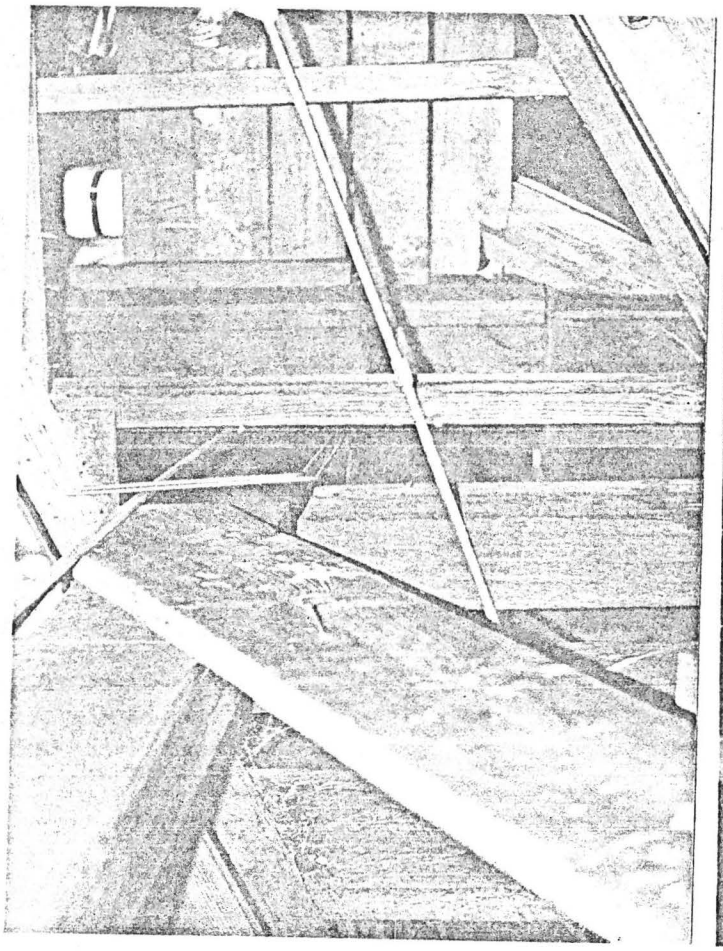
13. 1923 End Truss - top plate termite damage



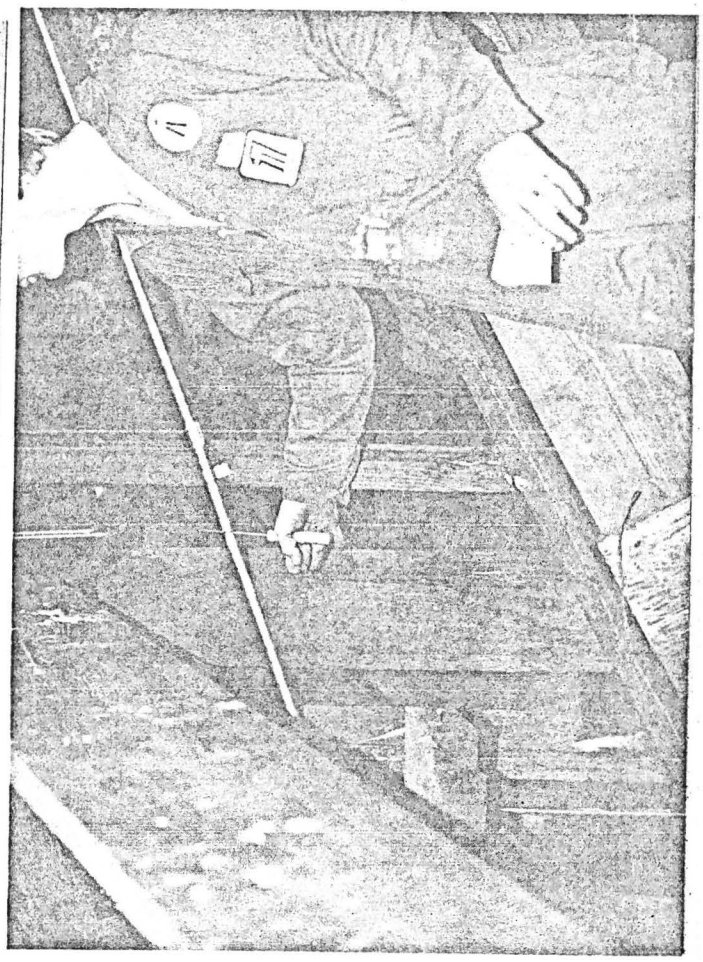
Waste basket with water in it due to a leak - near photo 13



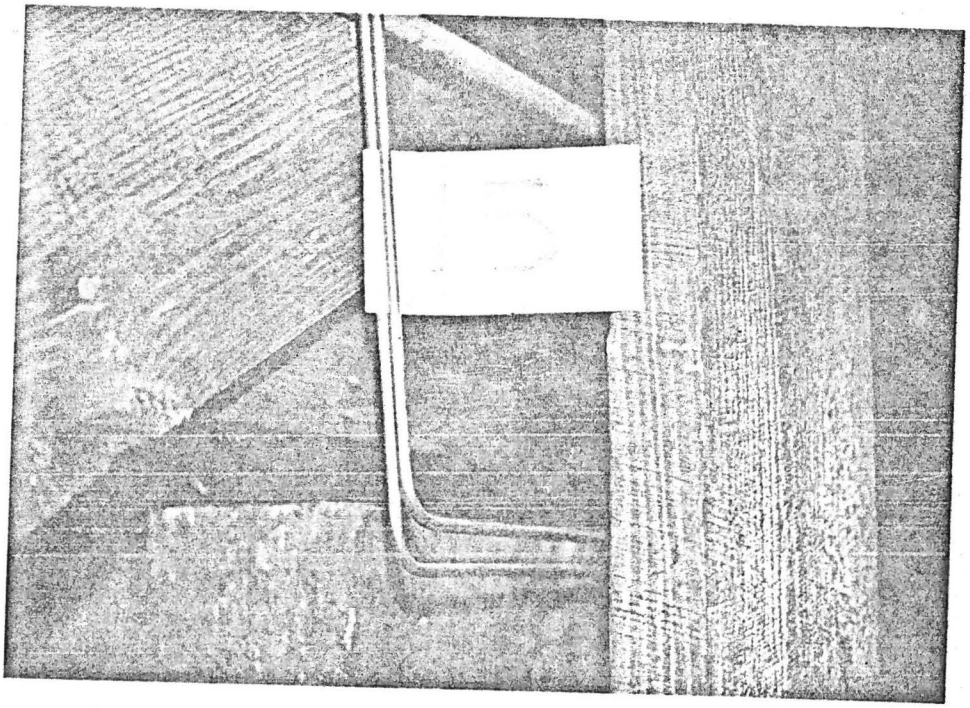
14^1 Gap showing movement near dome



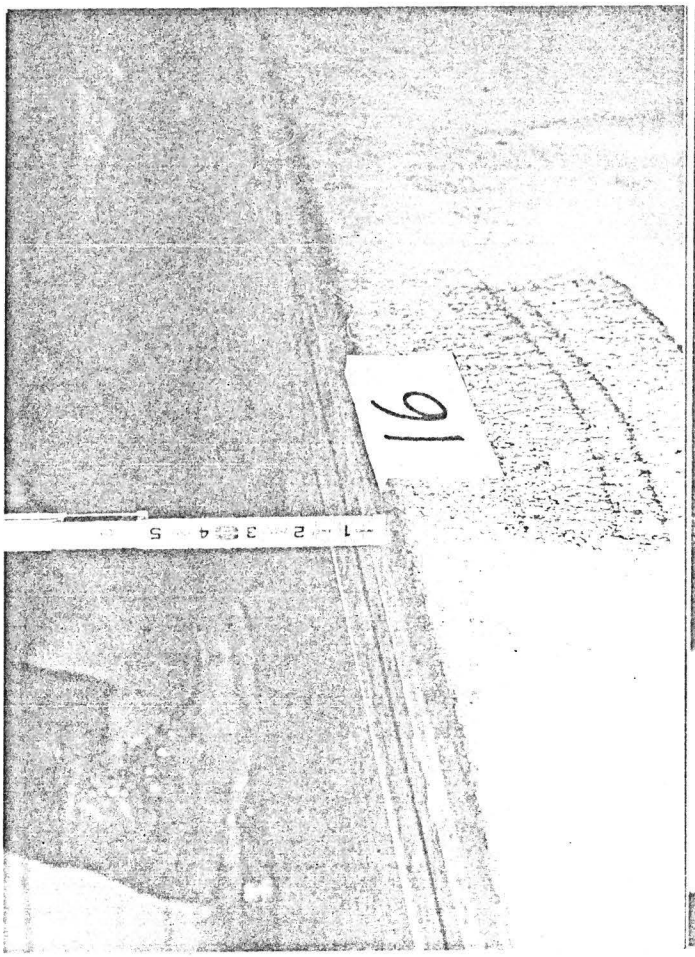
14^2 Gap showing movement near dome



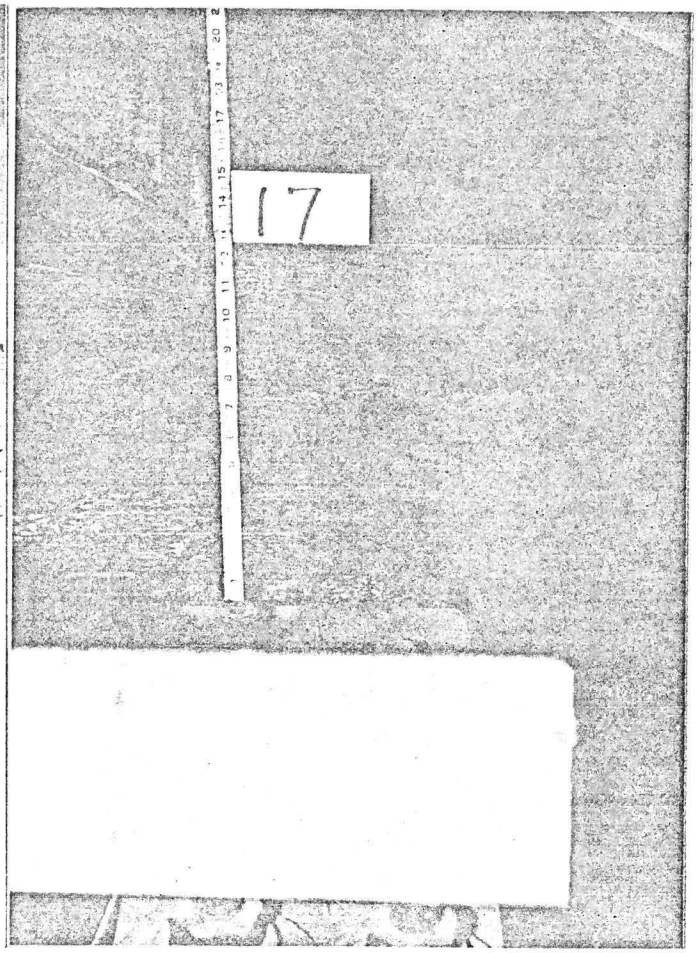
14^3 Gap showing movement near dome



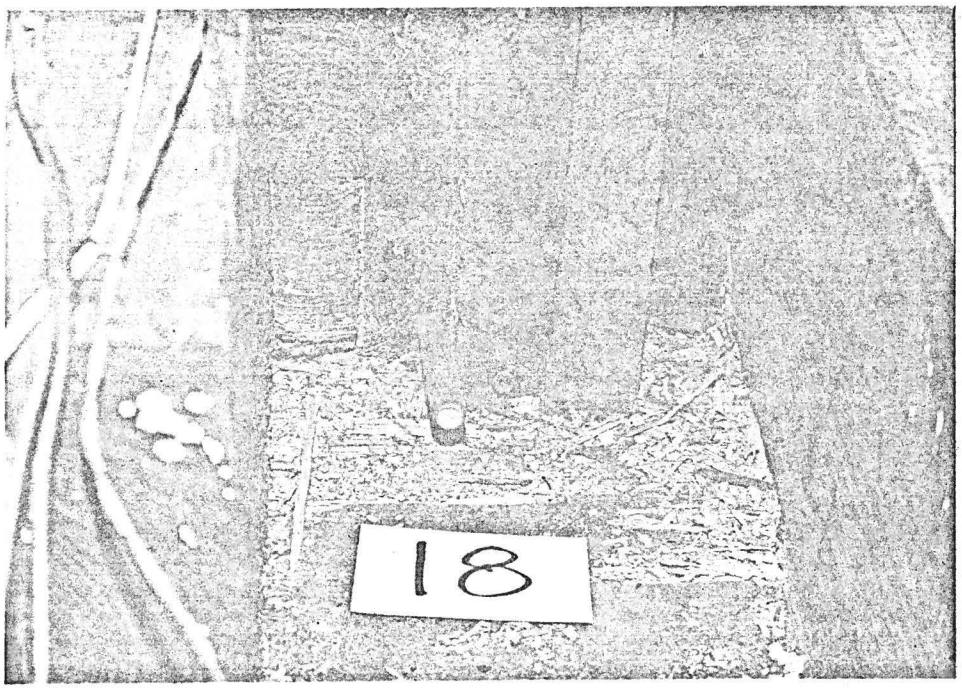
15. N-Truss N-W support air gap



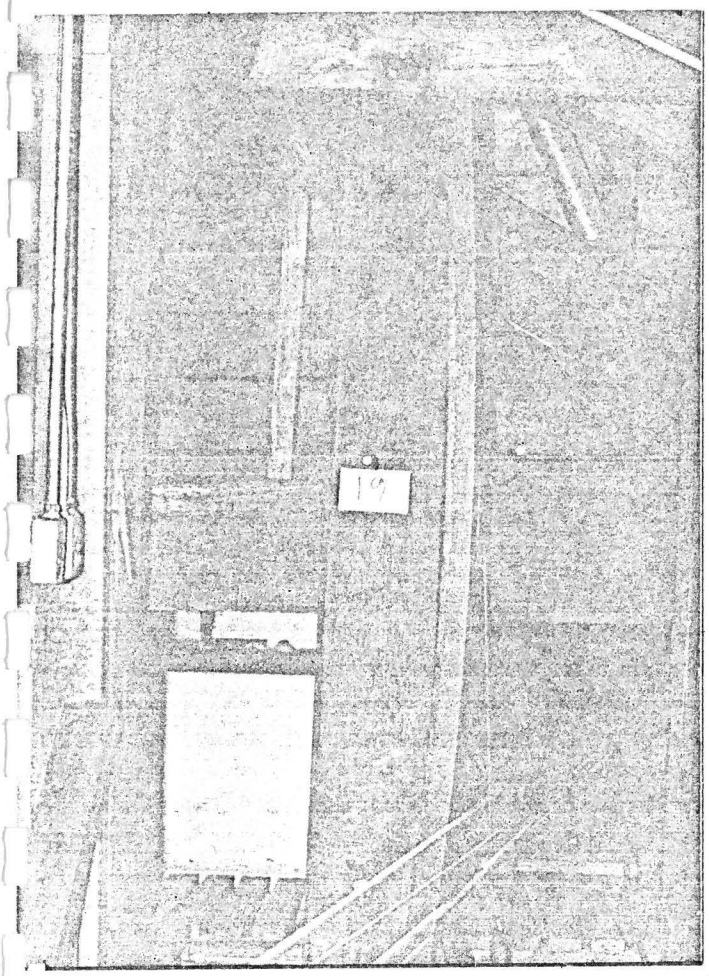
16. Deflection of w-side of ceiling top



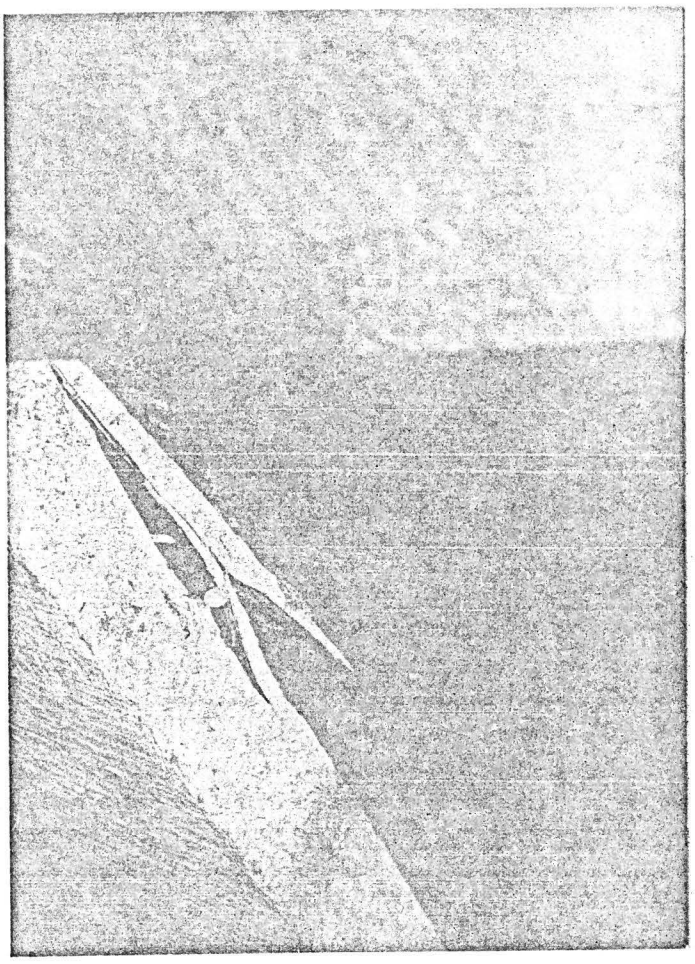
17. N-Truss bearing on W-Truss



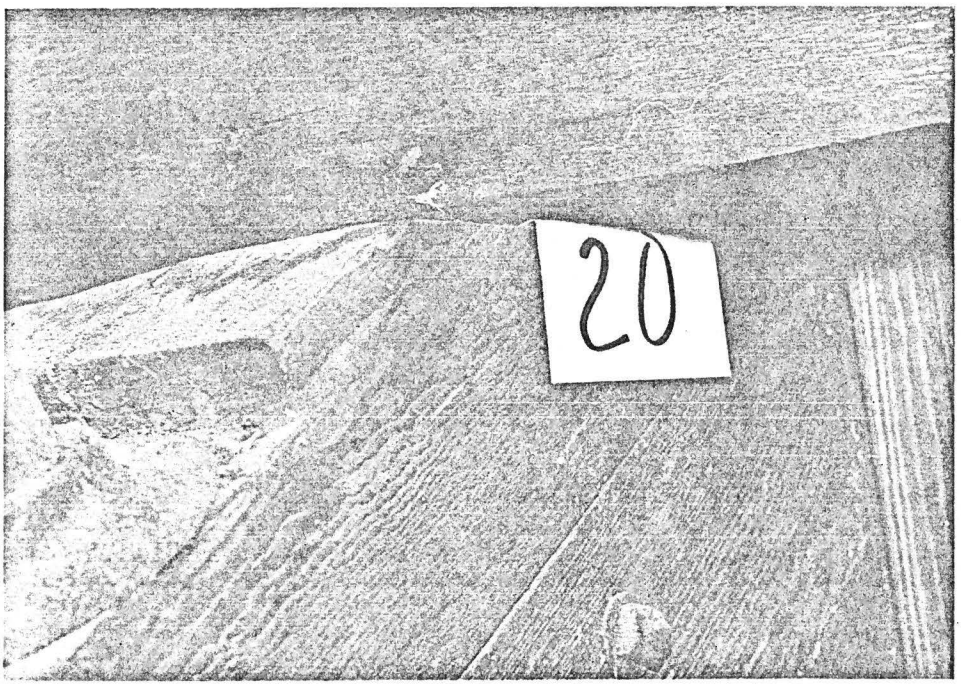
18. W-Truss - wooden bearing blocks - termites



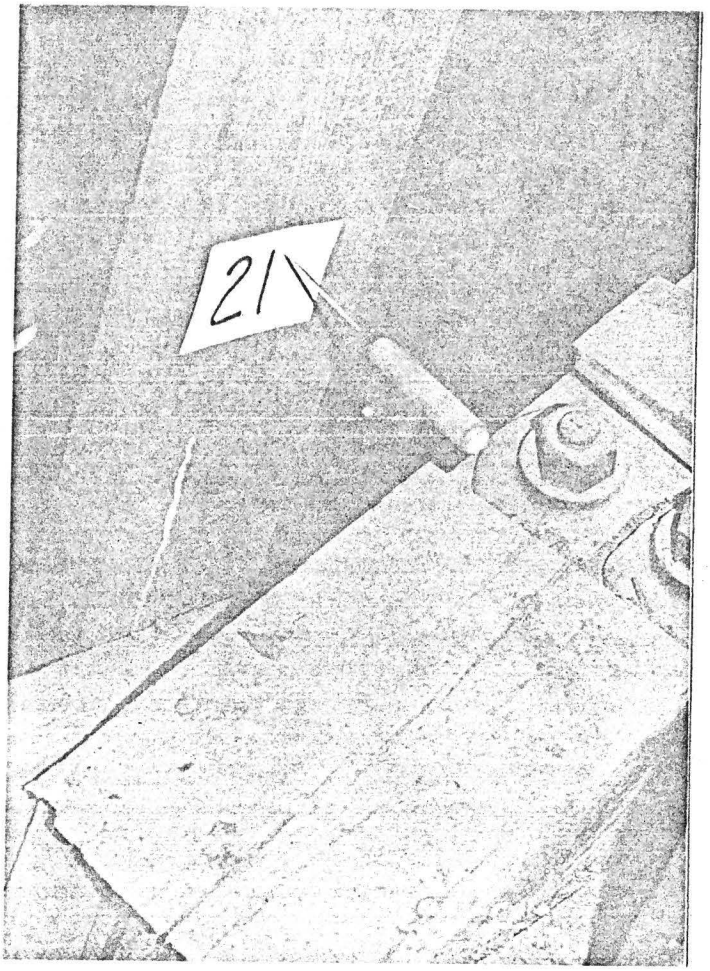
19^1 Bowed vertical N. side dome



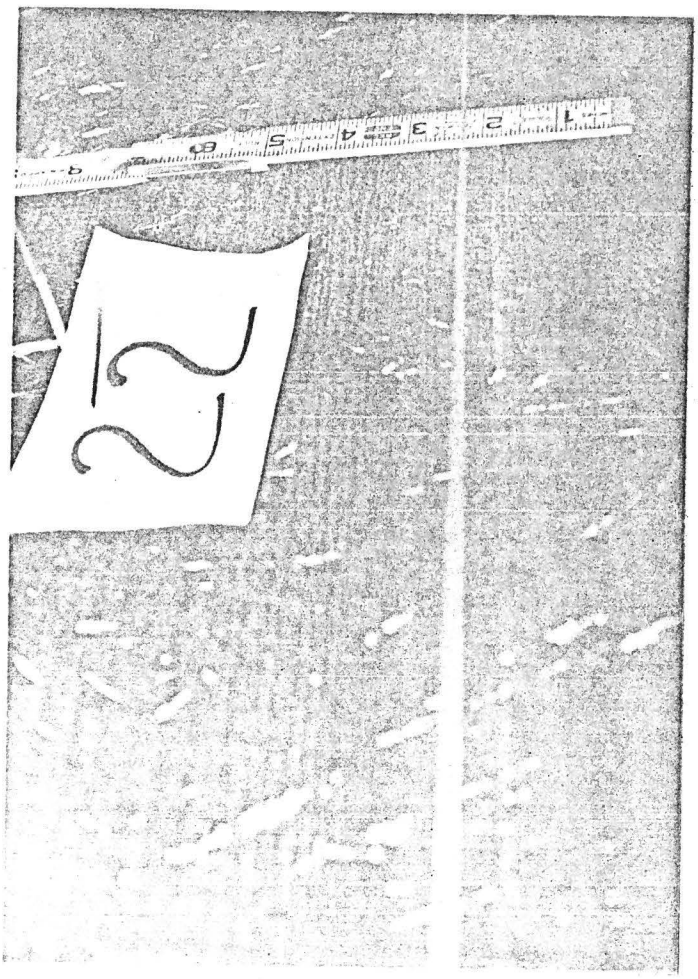
19^2 Bowed vertical N. side dome



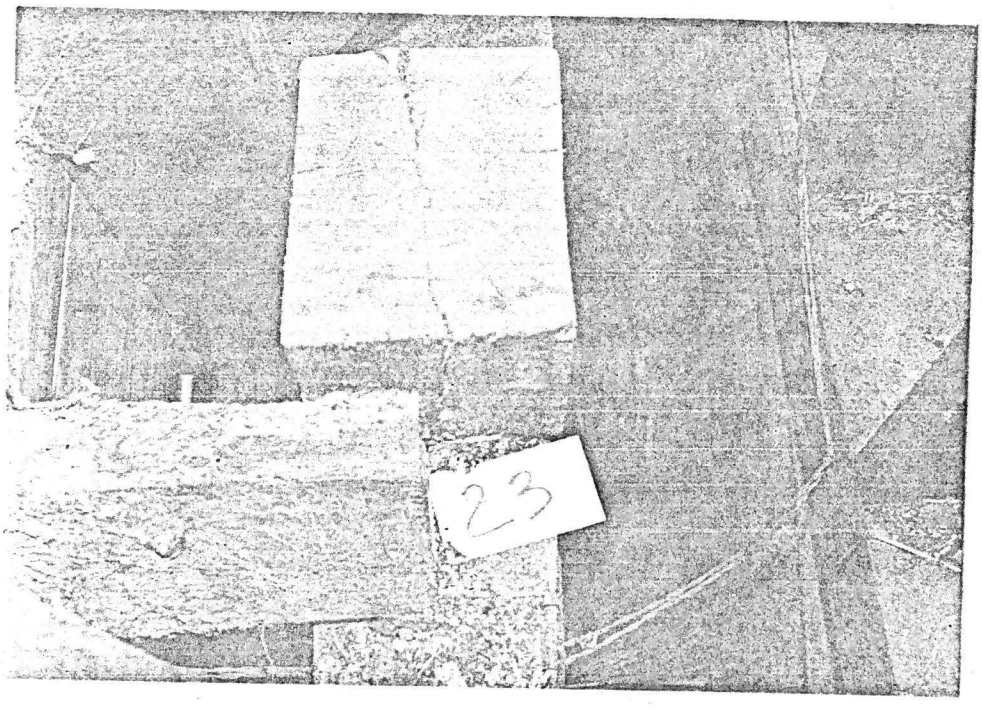
20. E. bearing of N-Truss on E-Truss



21. Termite tunnel at N. bearing of E-Truss

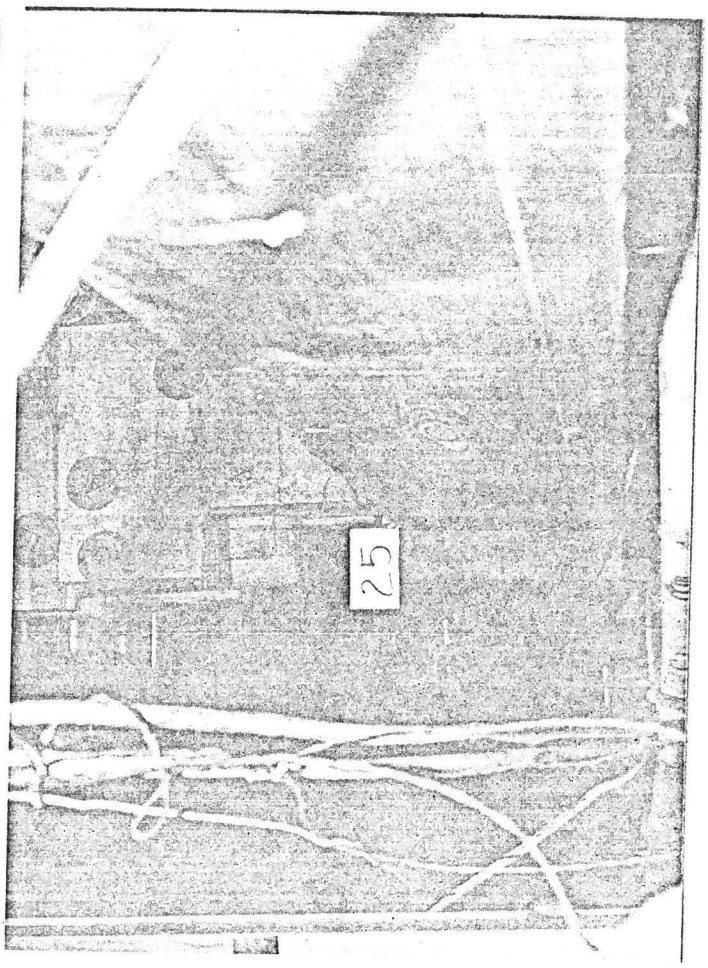


22. Central deflection of bot. chord of E-Truss

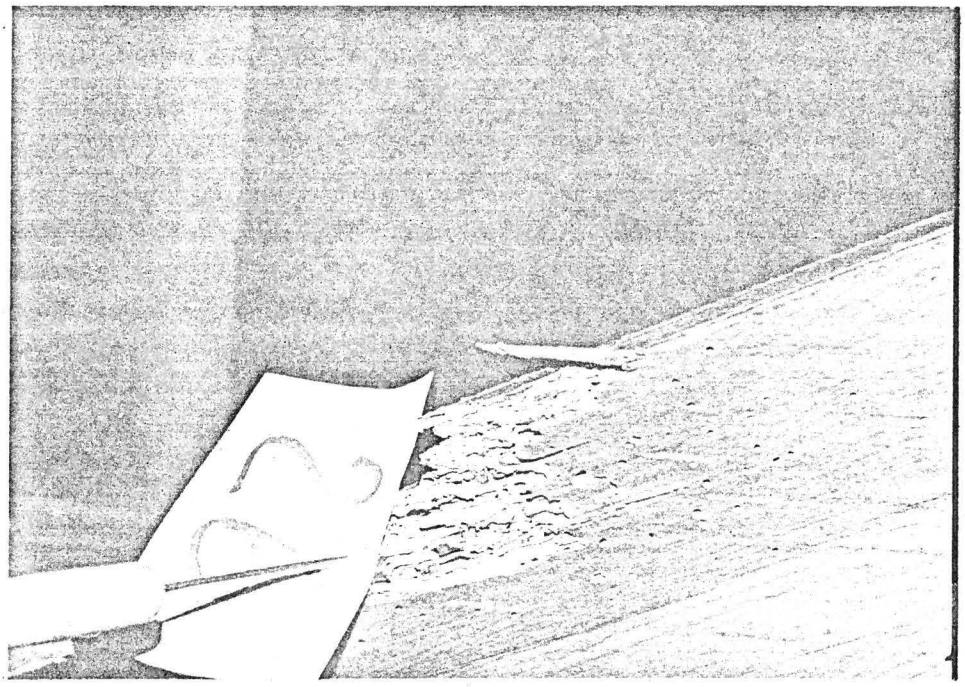


23. Movement at N. edge zone of dome

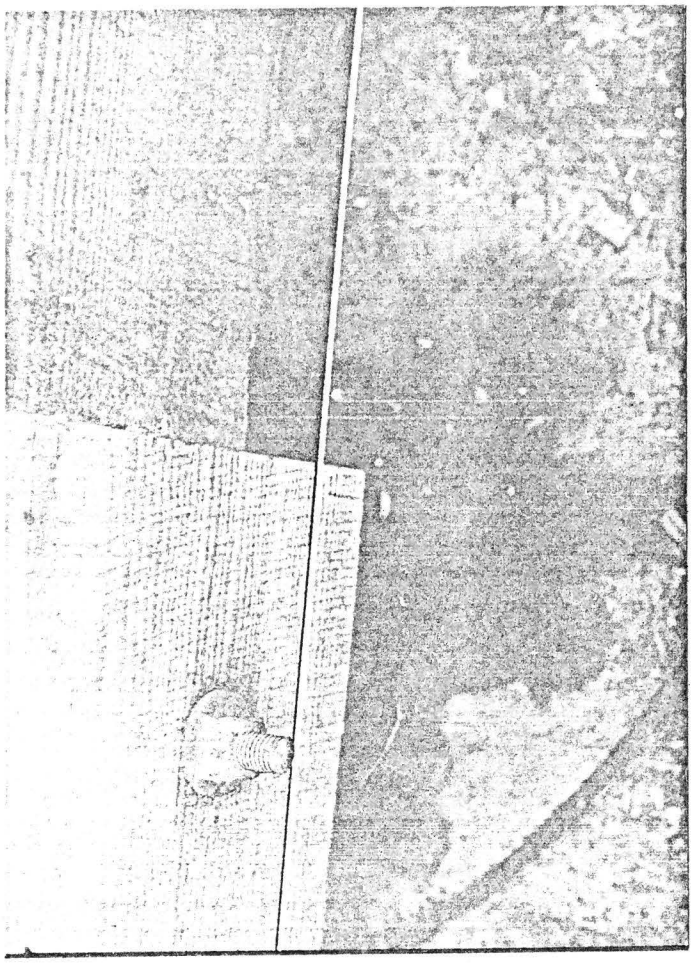
24[1] Bowing of members N. of dome



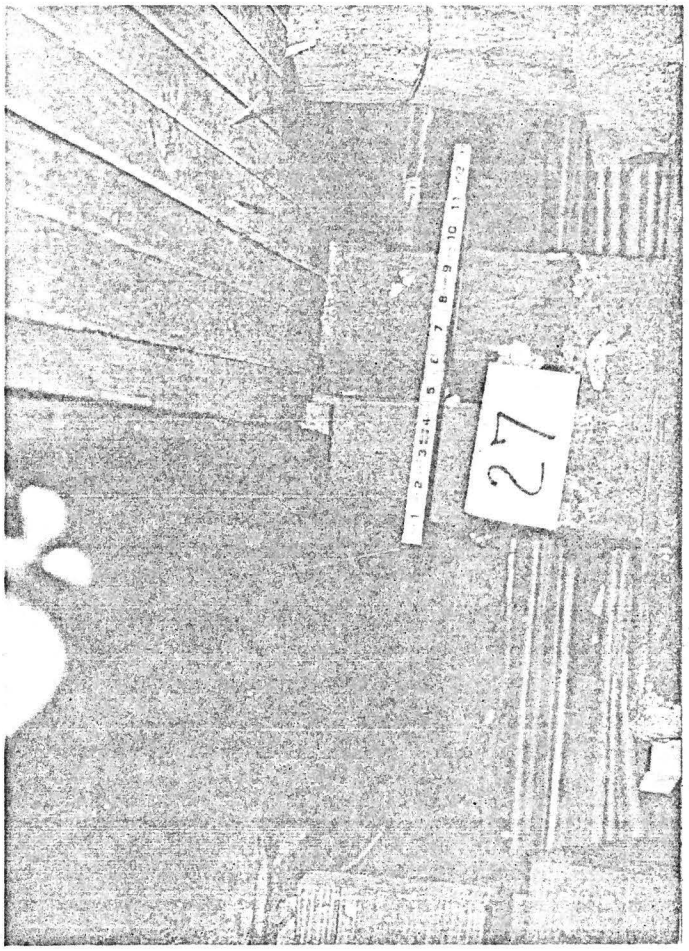
25. E-Truss deflection of bot chord



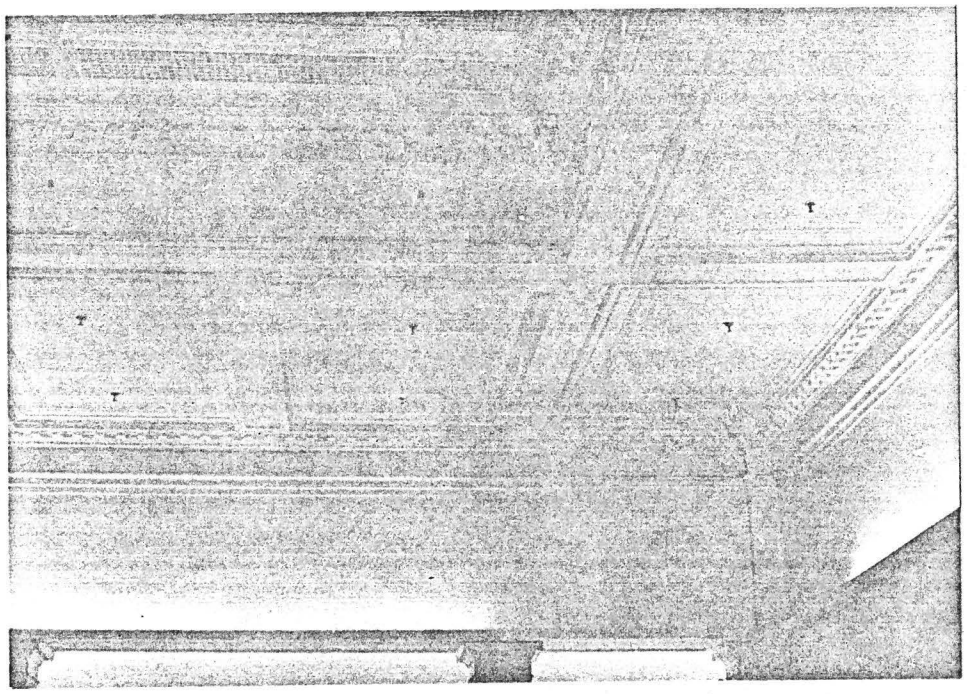
26. Borer beetle in diagonal member near E-Truss



Deflection of E-Truss @ ceiling load point on South side

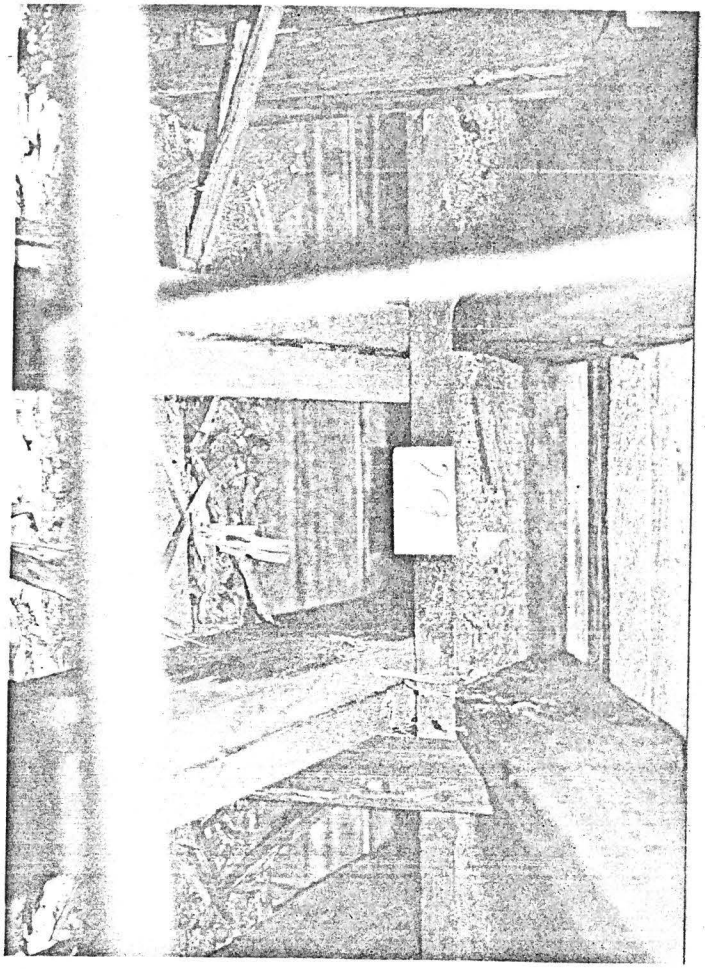


27. Twist in ceiling tied beam N.E. side

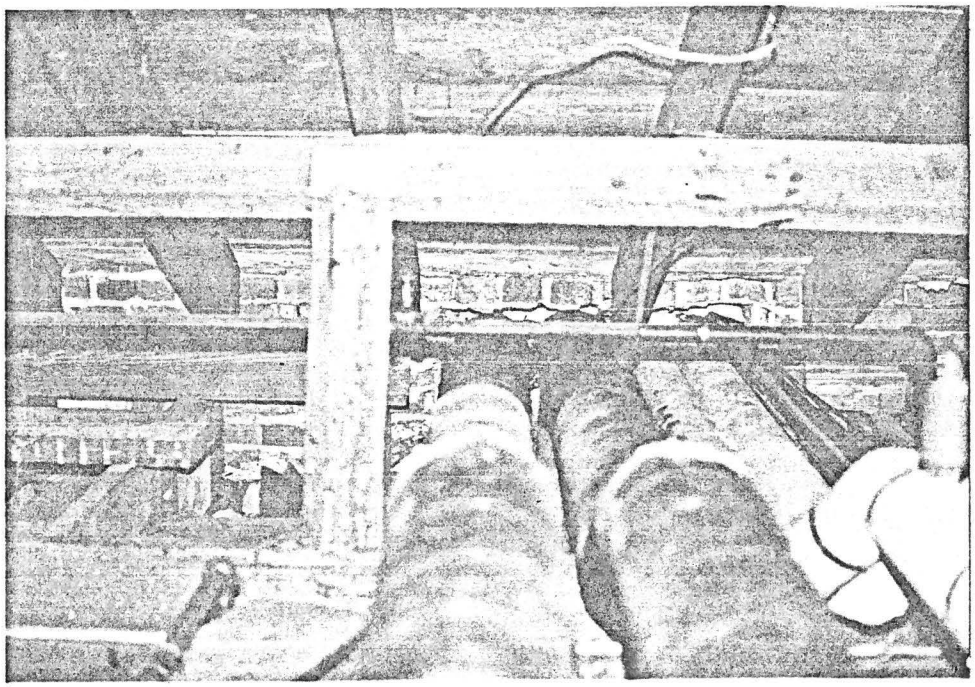


Ceiling under W-Truss looking West

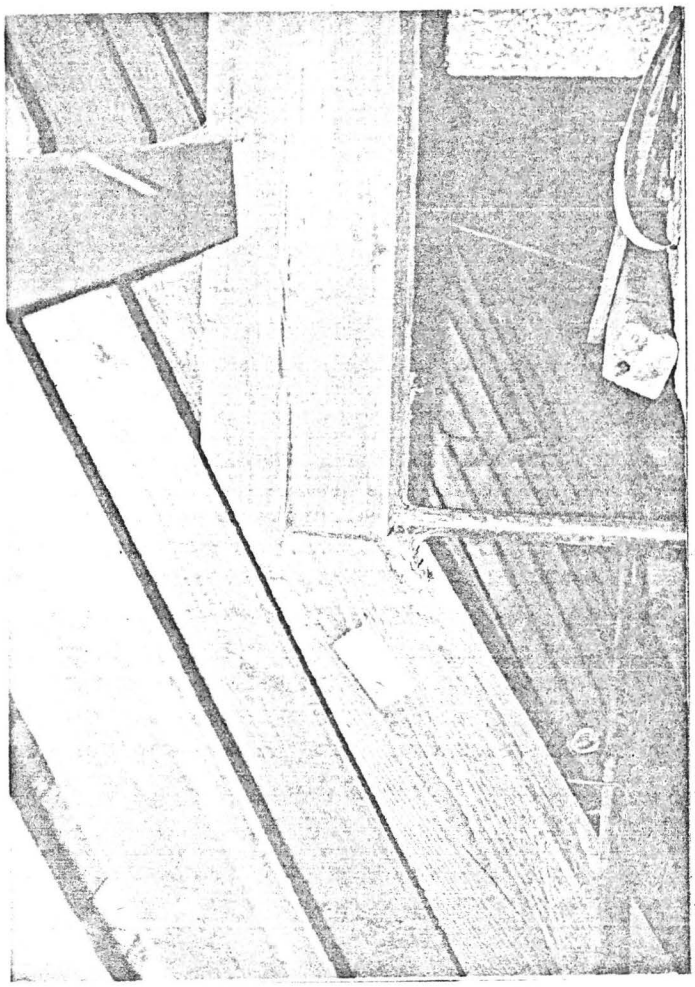
28. Wood rot - near eaves



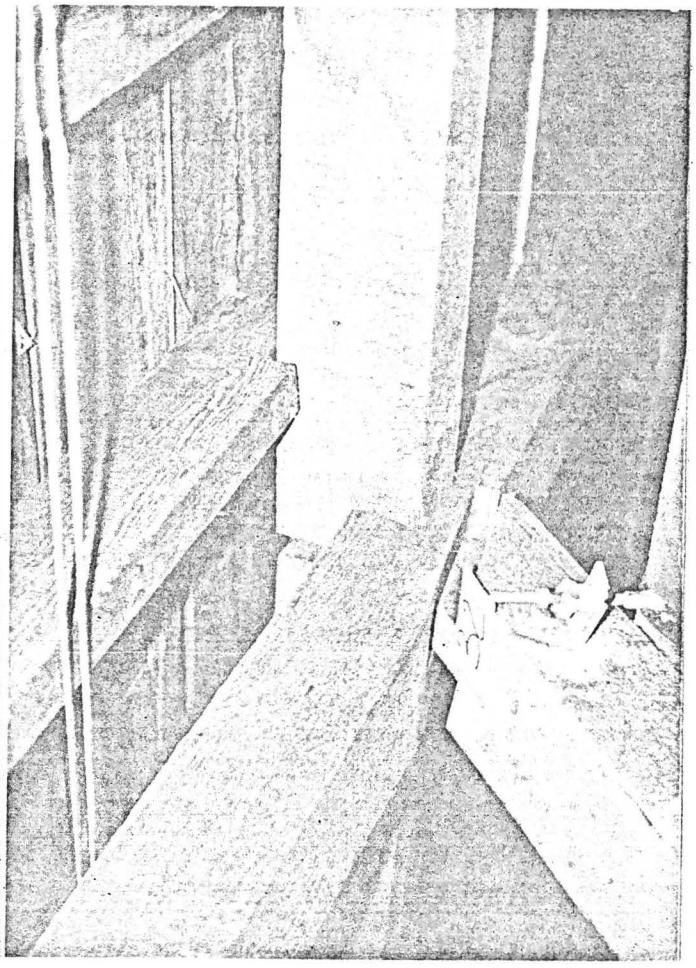
29. Wood rot in top plate - W. side



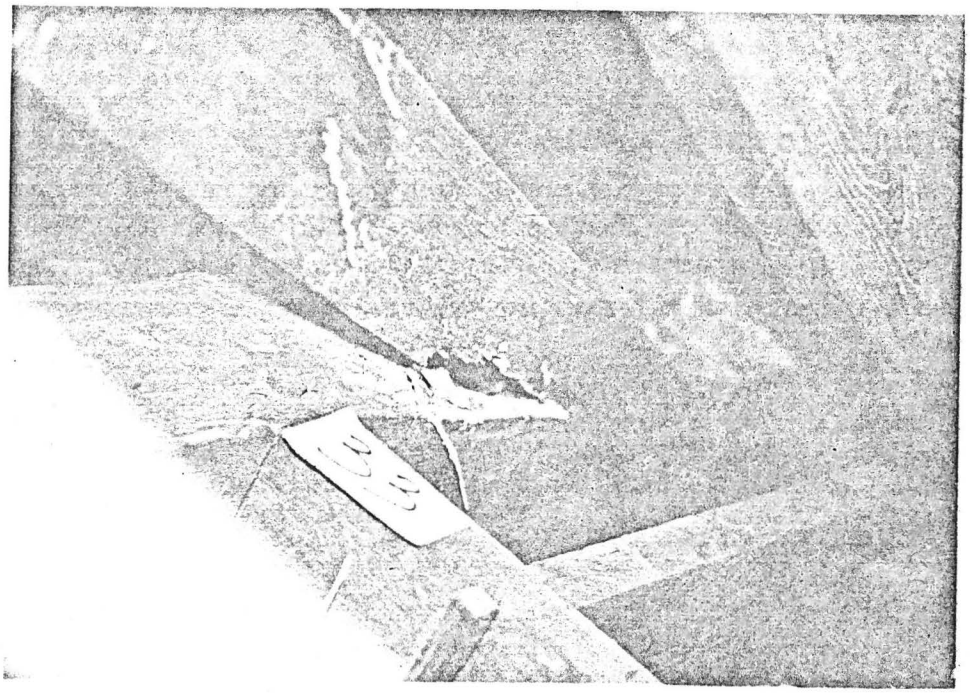
30. Extra support



31. NF_3 - N. end - horizontal crack

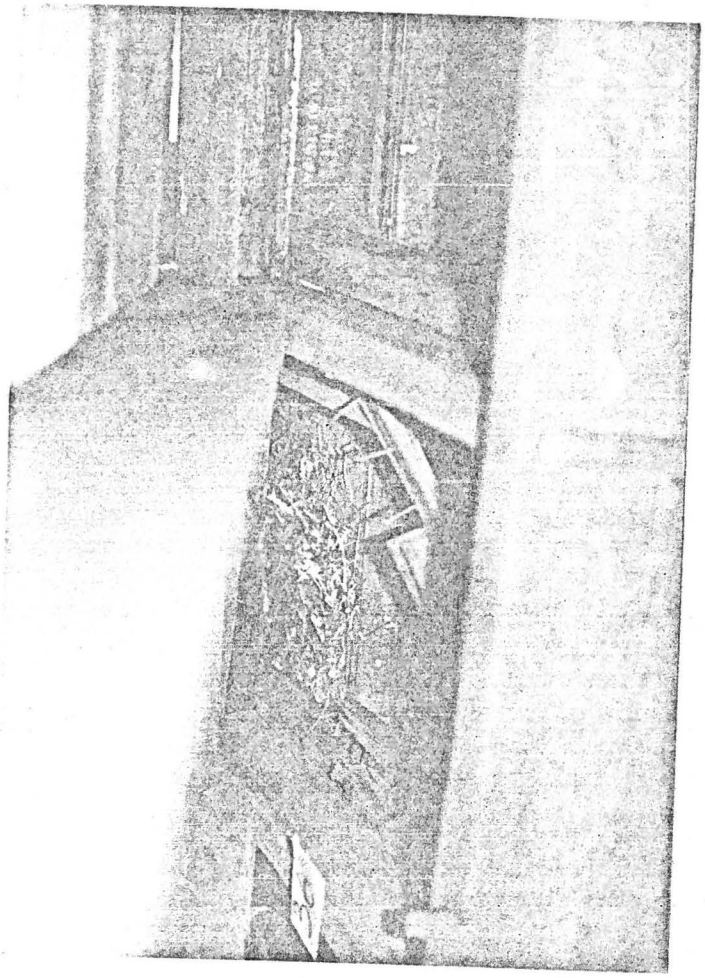


32. Compression diagonal pulling out

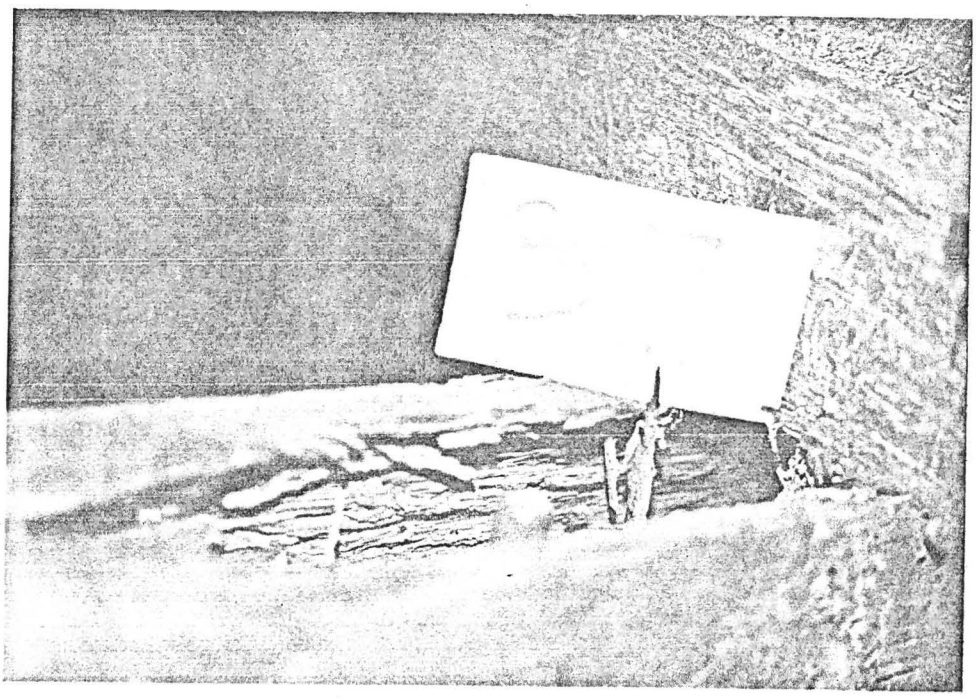


33. Wood rot - lower diagonal and bottom chord

34. Frame S_3 - top chord leaning and cracking

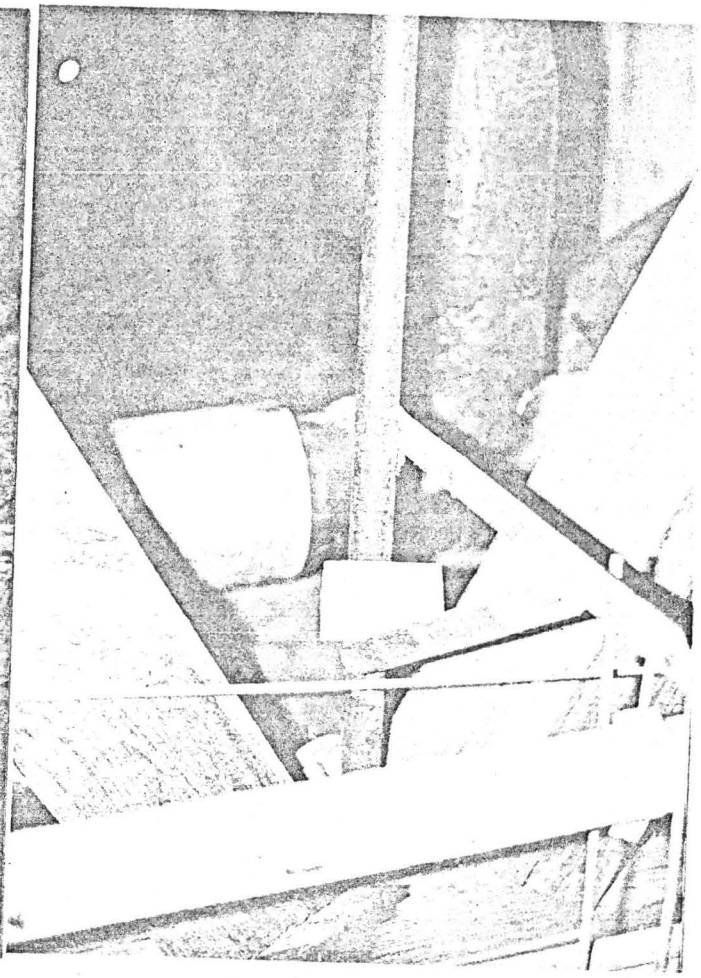


36. Wood rot in horizontal edge member

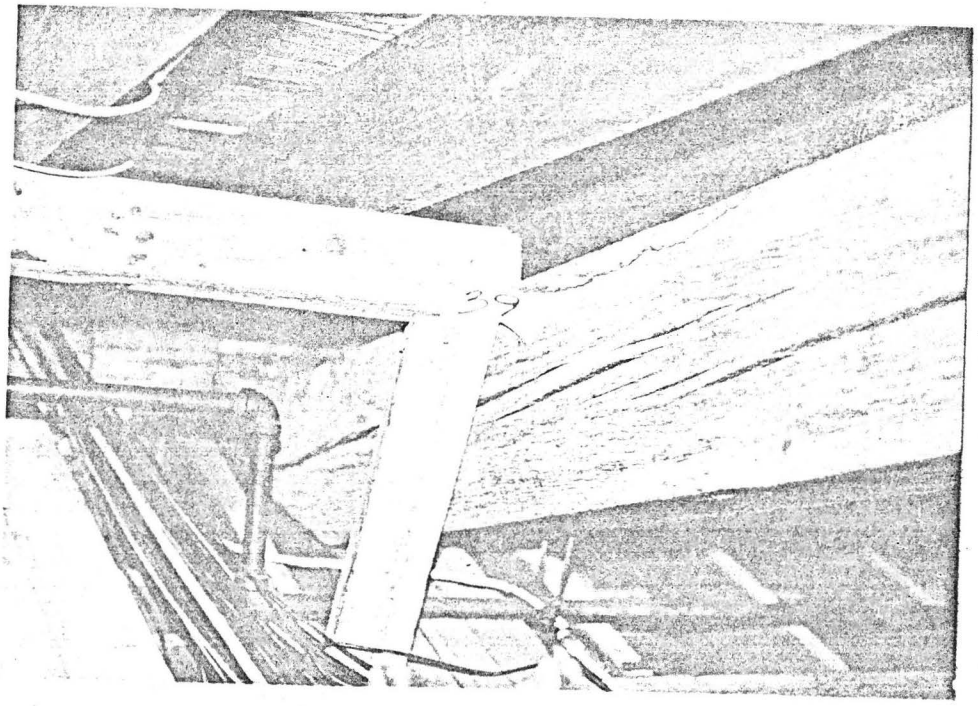


37^1 Wet rot under leak - in top chord South

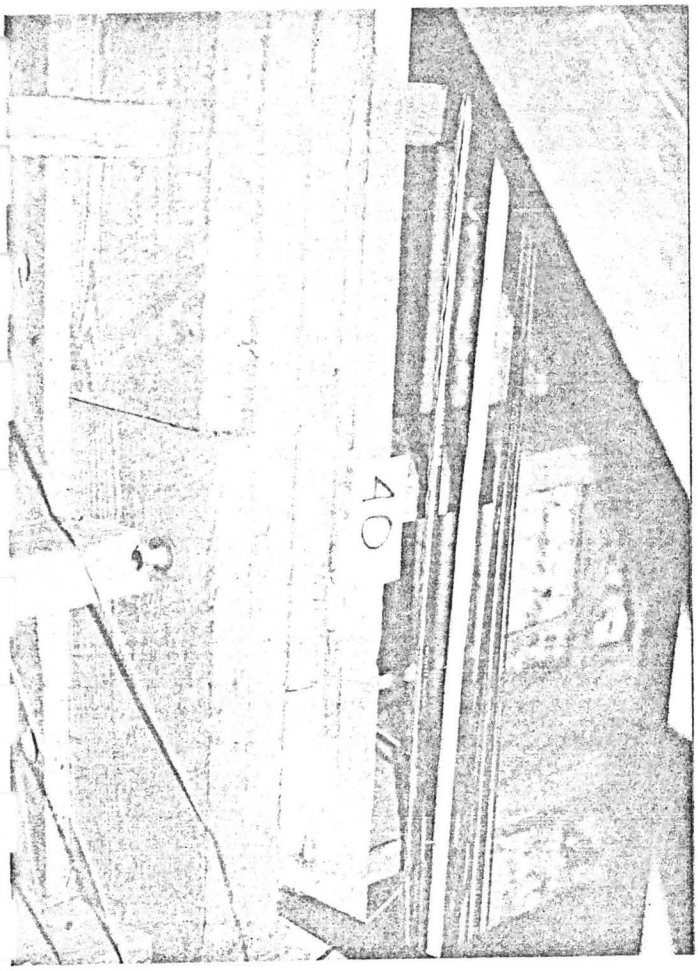
37[2] Wet rot in top plate below South



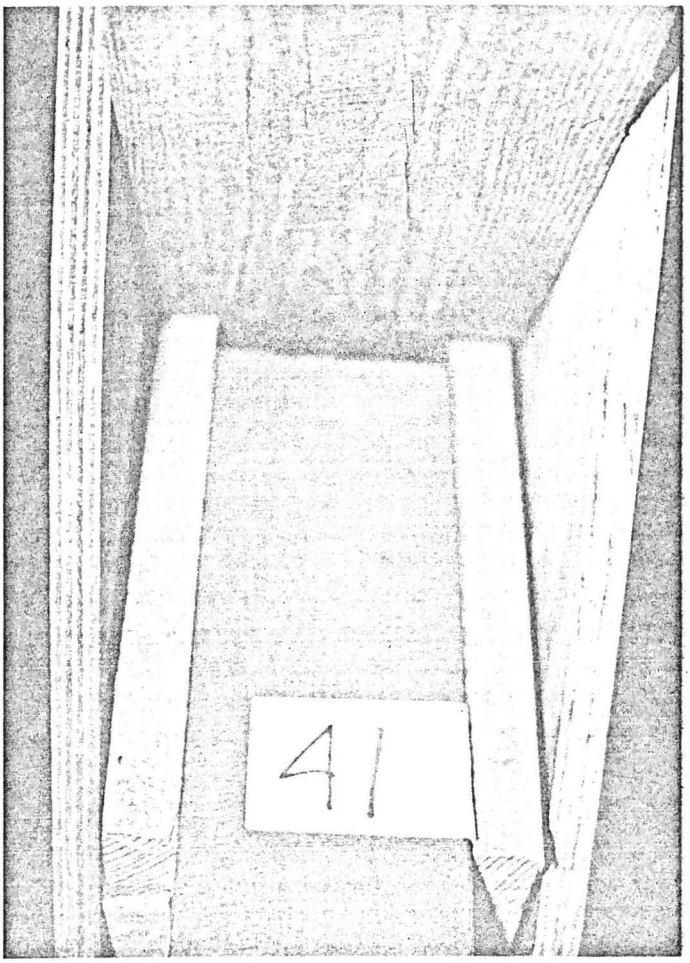
38. Welded pipe support to main tension tie W-Truss



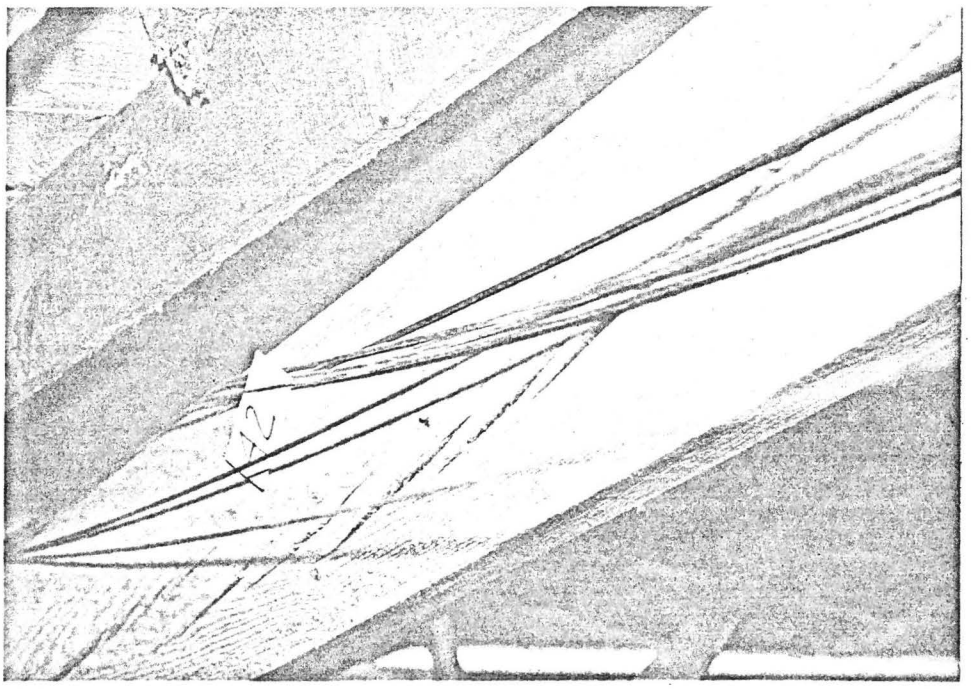
39. Horizontal shear failure and weather checking - NF1



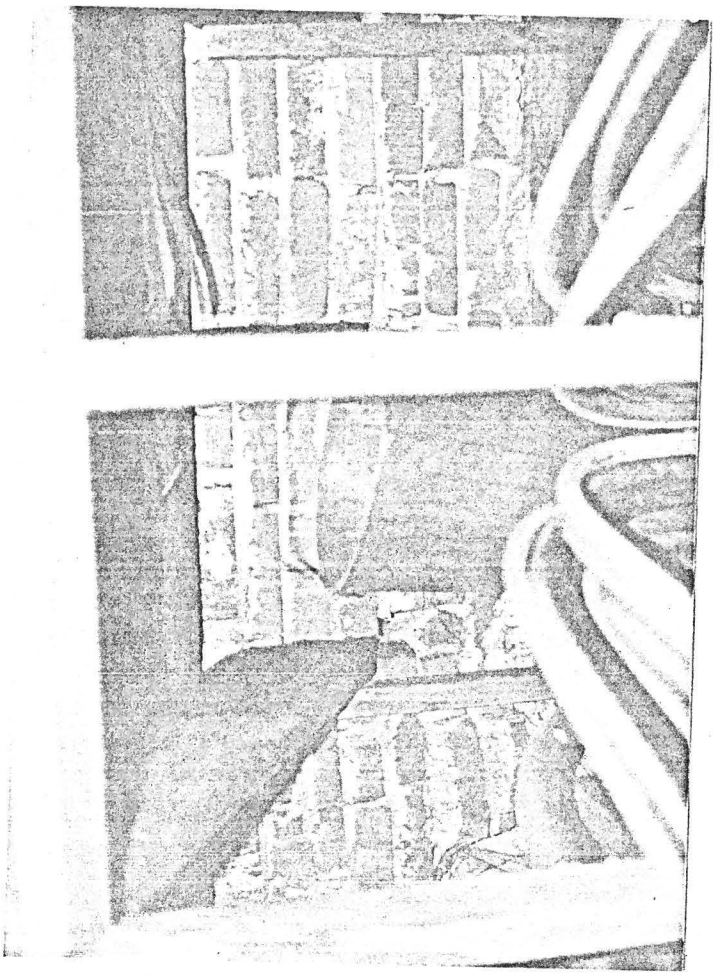
40. Lower tension chord of NF_1 with butt joints



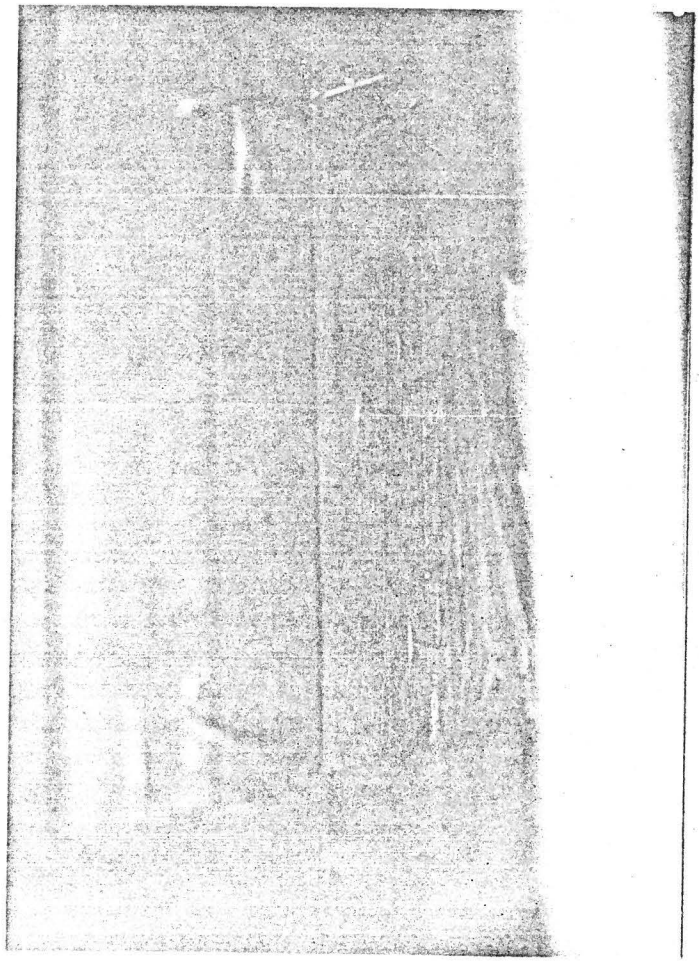
41. NF_2 N-side gusset joint



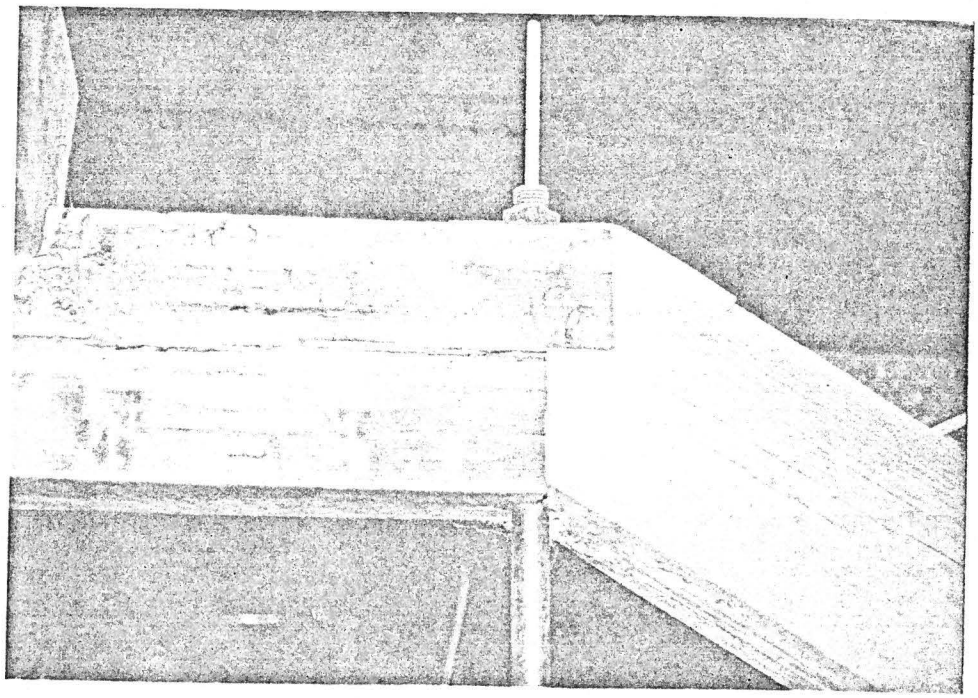
42. Weather checking in diagonal chord frame NF_3



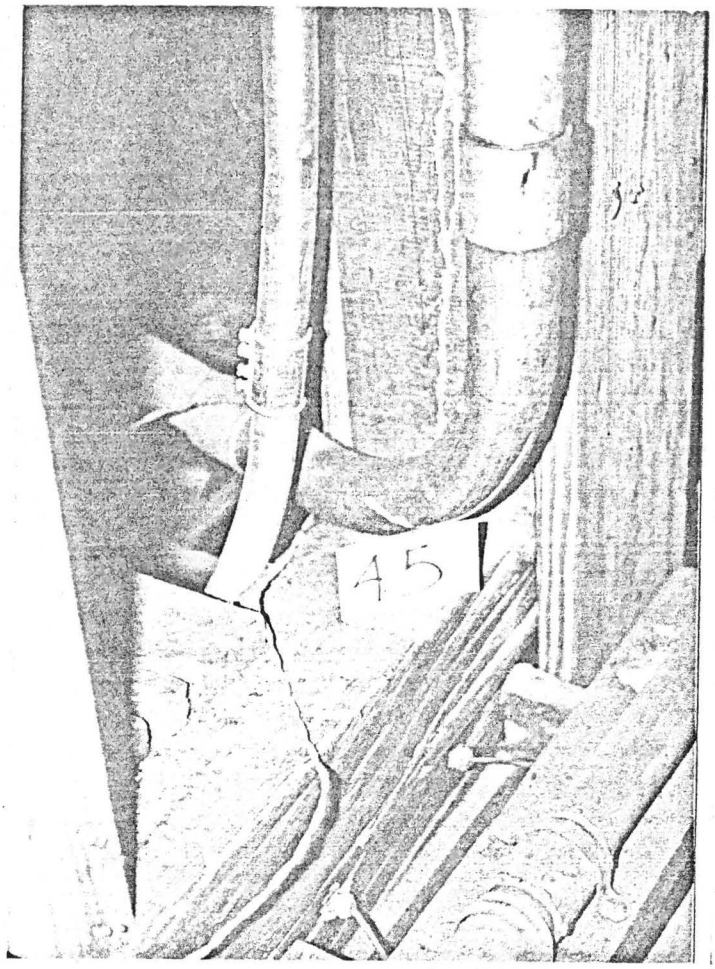
Wet rot in roof South section



Wet rot - roof - South section

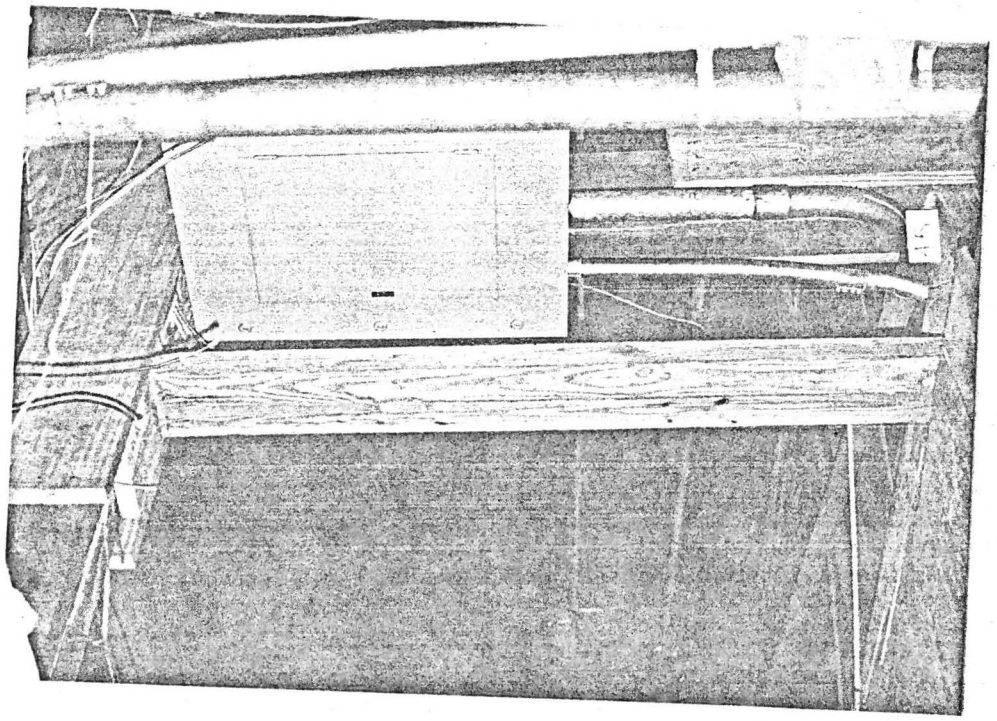


44. Top joint Frame SF_4

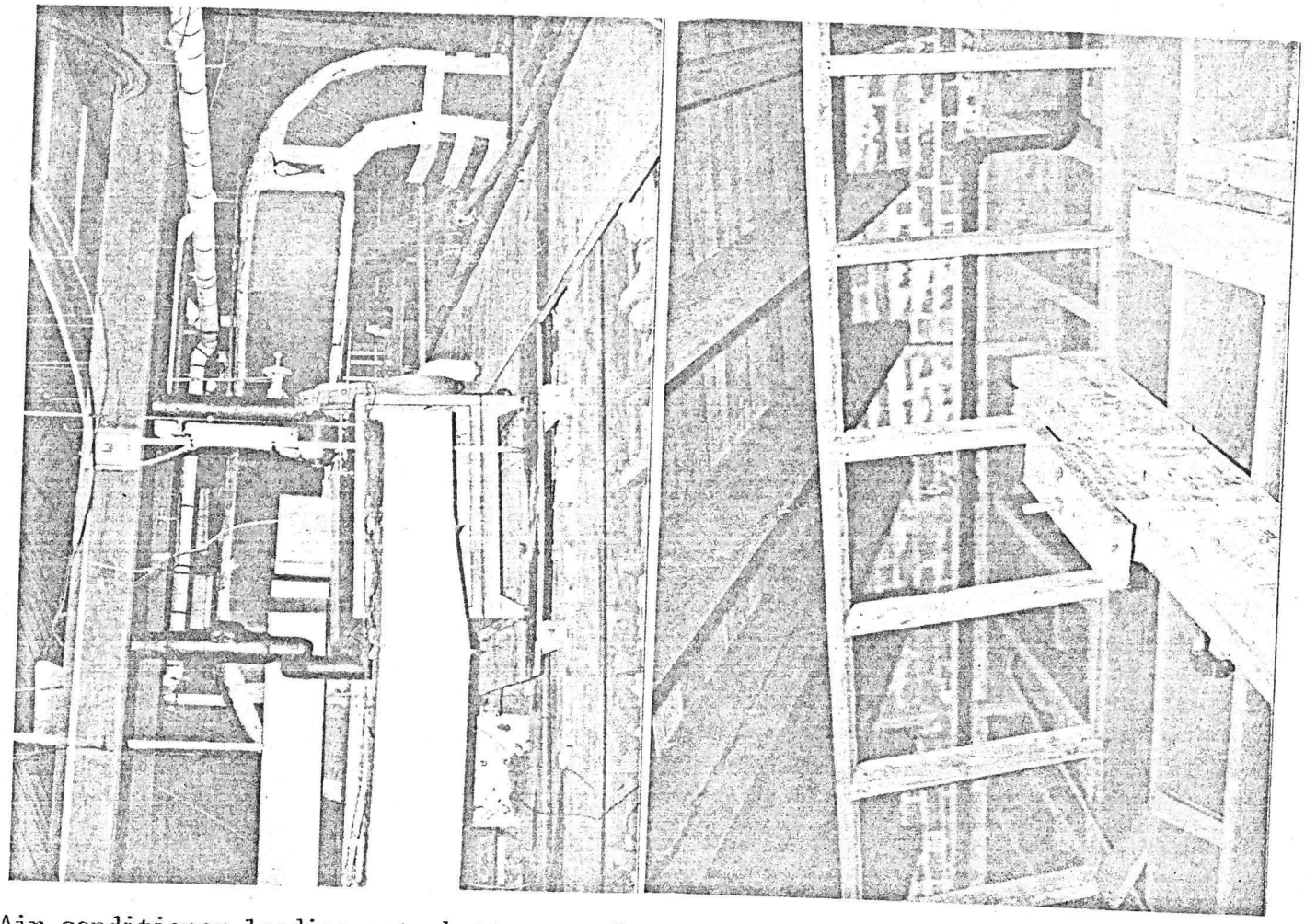


45. Lower joint Frame S_1 - termite and weathering cracks

46. Upper joint Frame S_1 - termite and weathering cracks

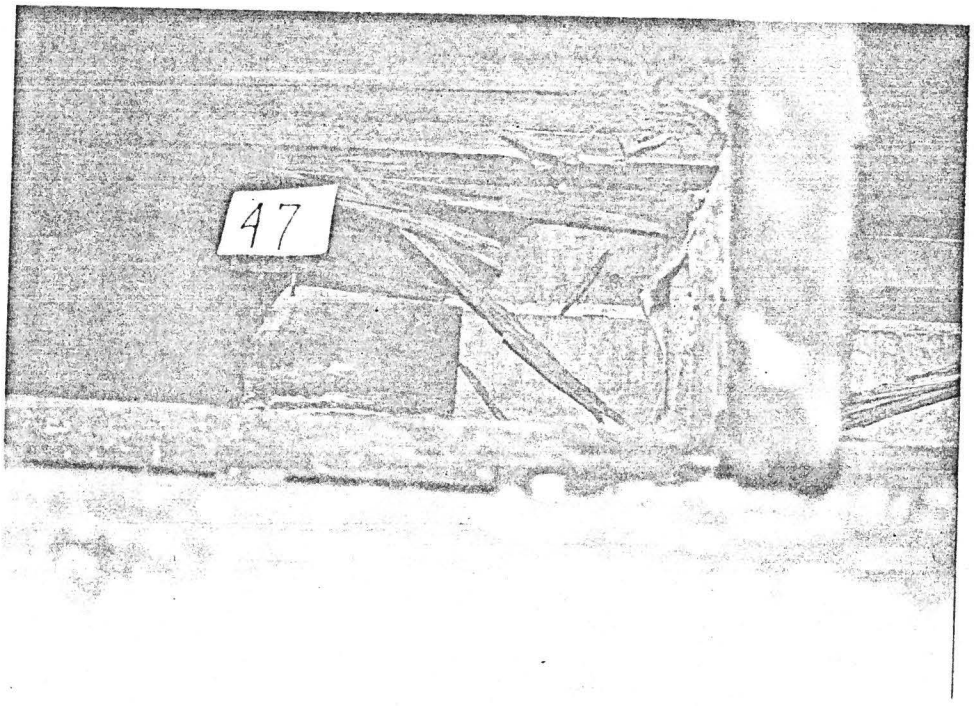


Extra support Frame S_1

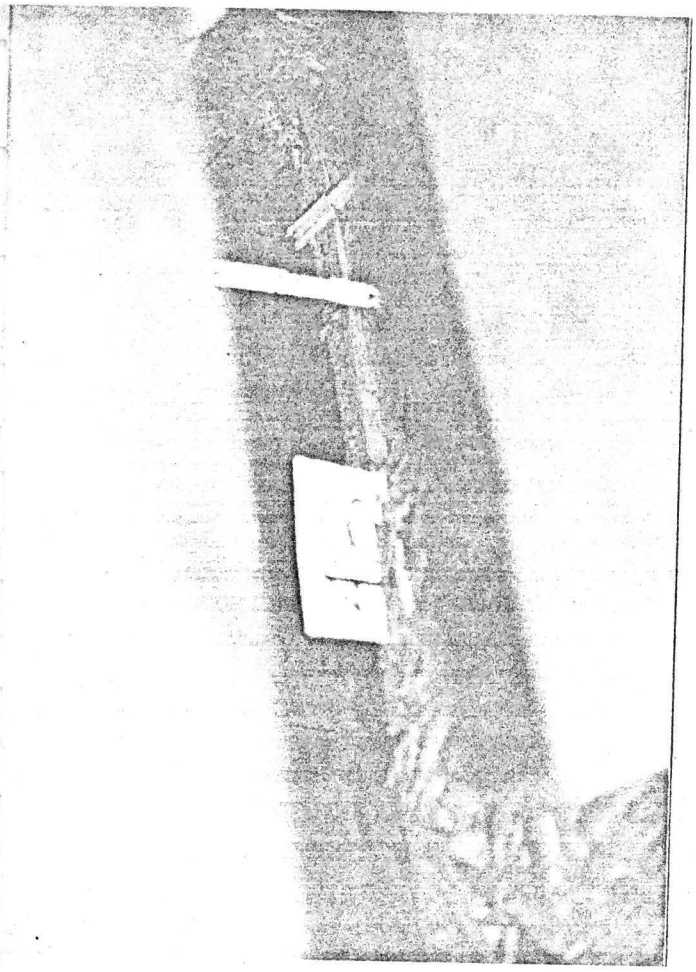


47^1 Air conditioner loading onto bottom chord Frame S_3

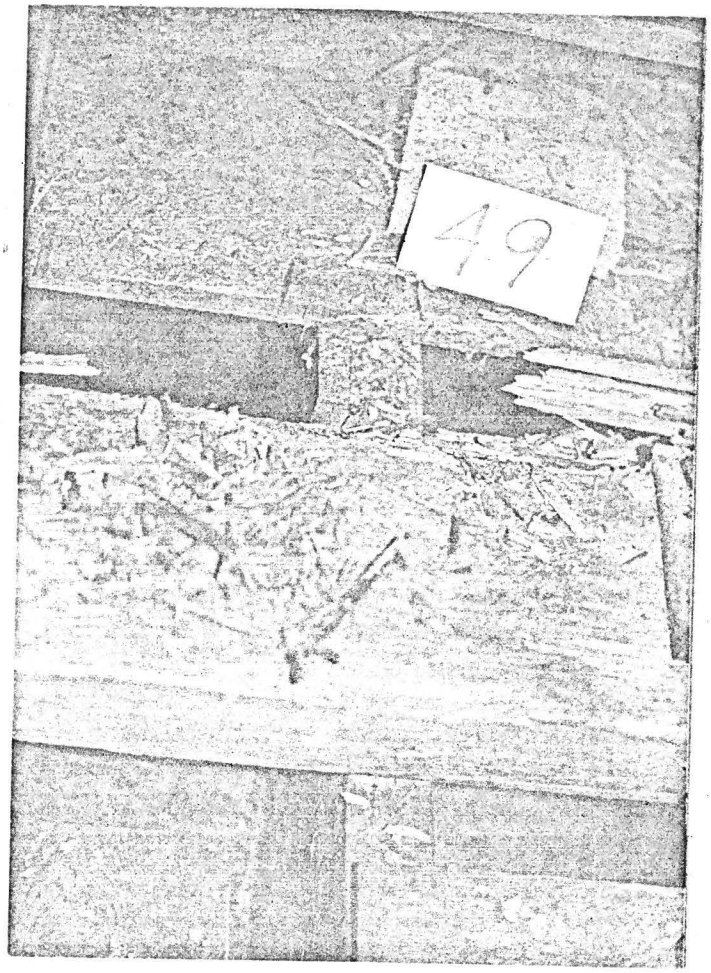
Support for stairs to mezzanine - S. end



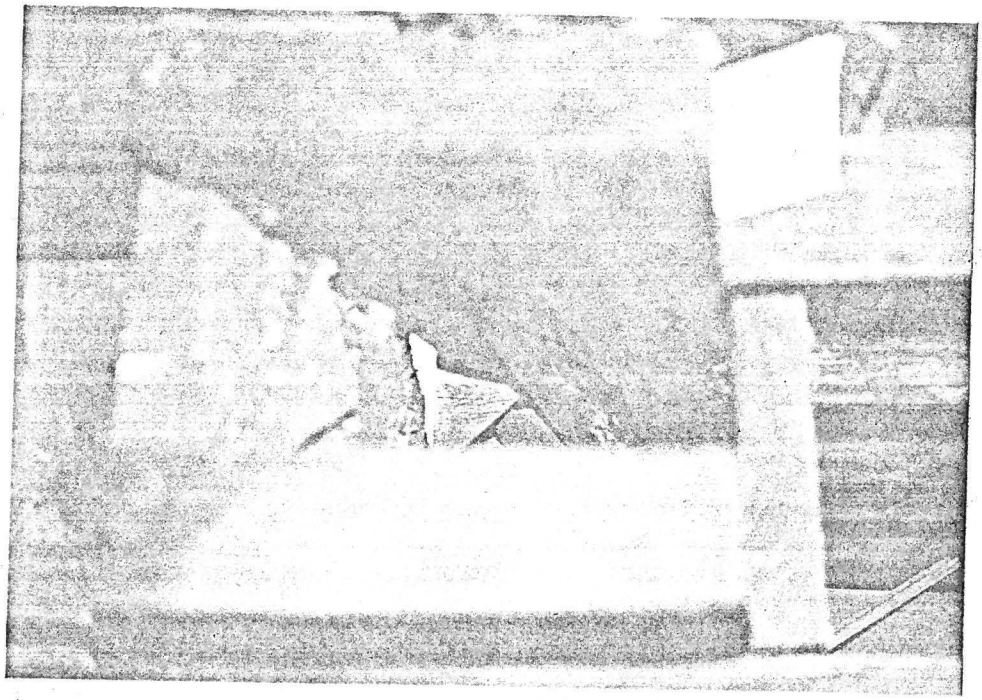
47^2 Wet rot near base plate of dome



48. Rot in plate around perimeter of dome

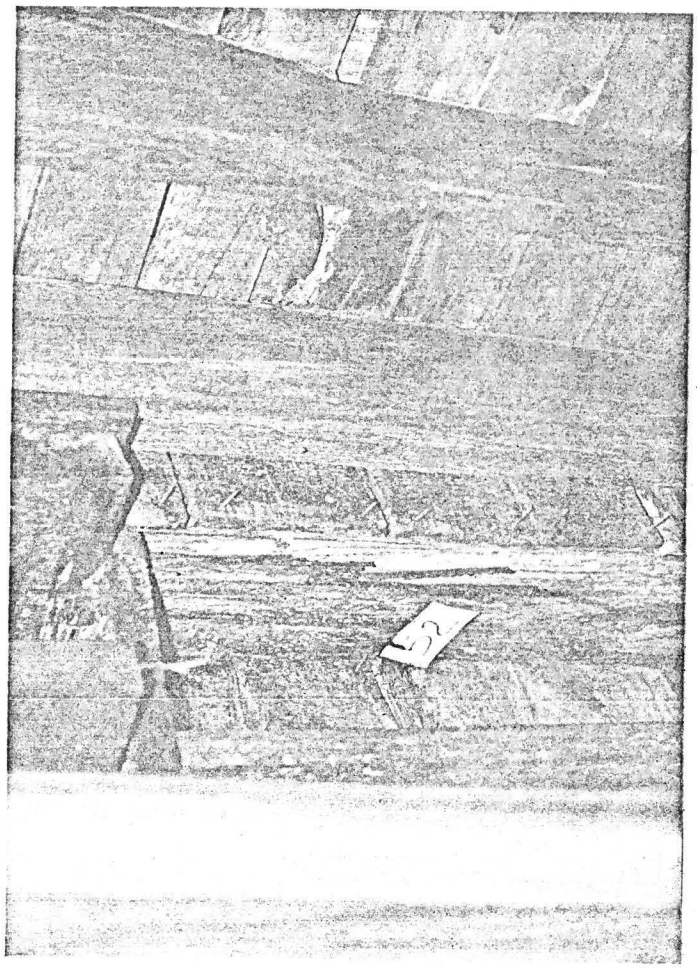


49. Wood rot in circumferential horizontal beam

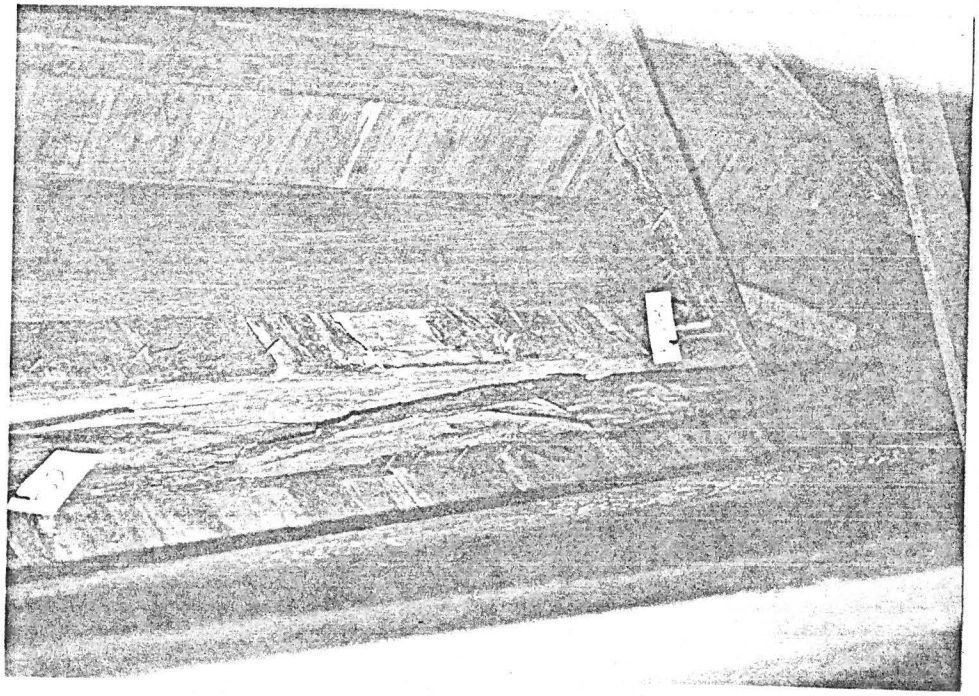


50. Wood rot in horizontal and vertical bracing

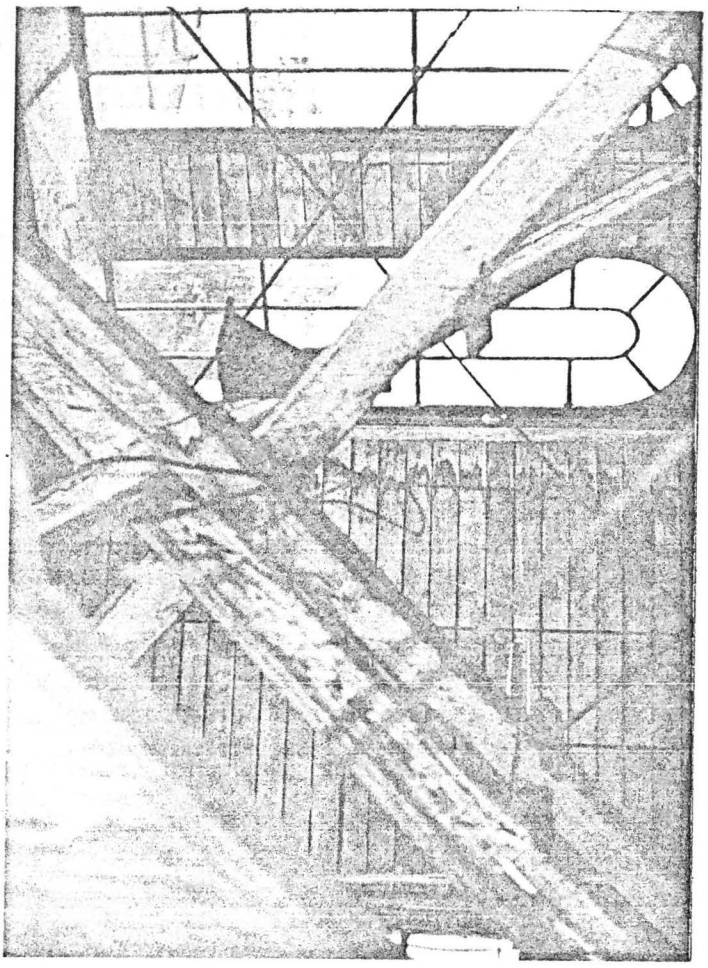
51. Debris & wood rot at bot. of dome corners



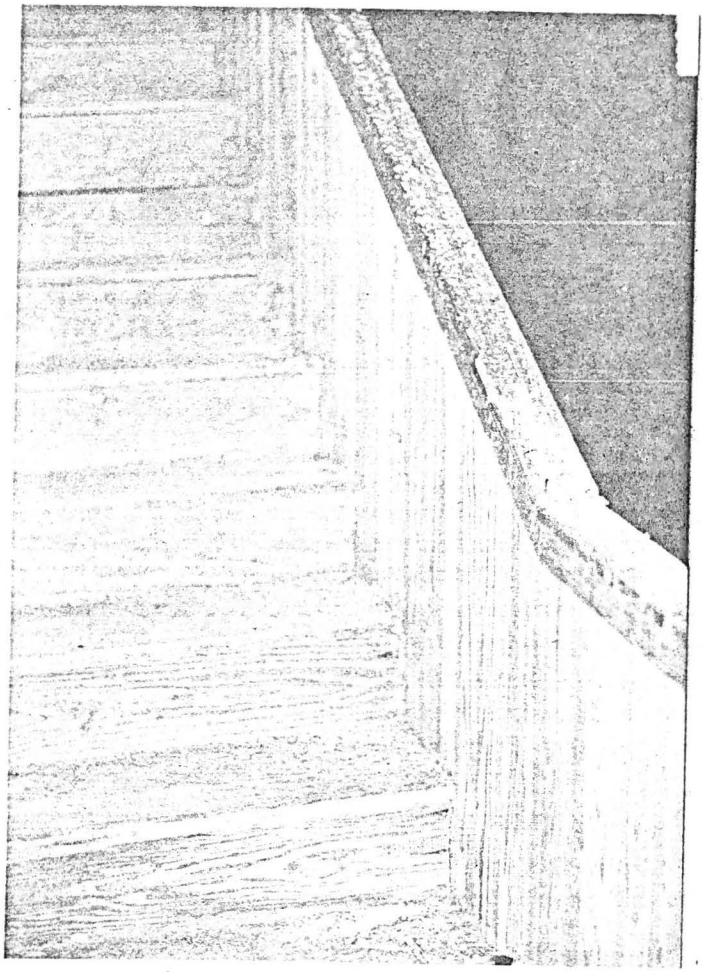
52. Severe water damage near dome corners



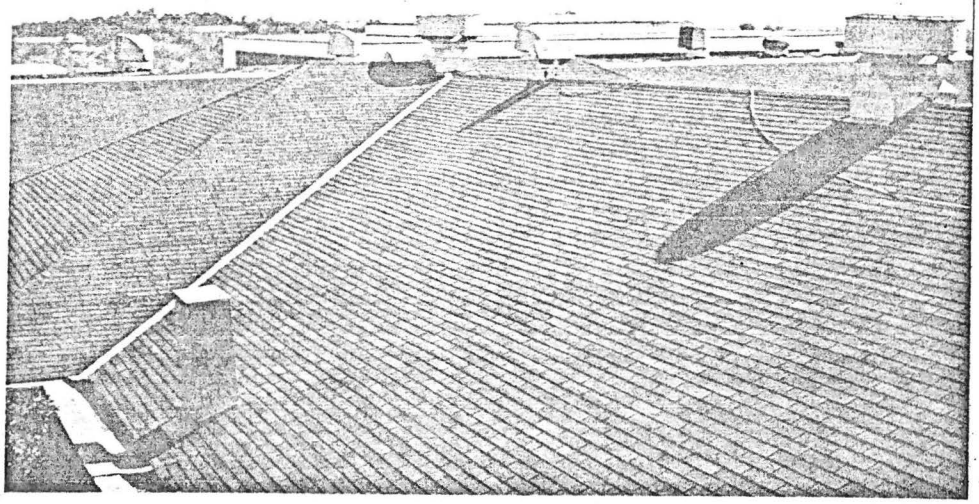
53. Severe water damage near dome corners



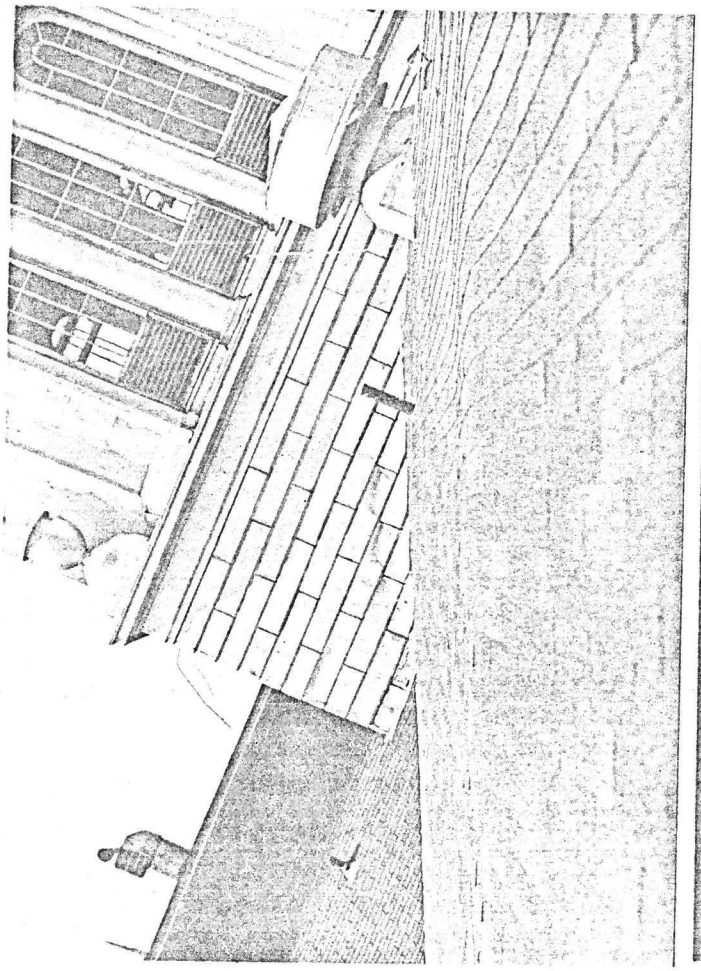
54. Cross framing which used to support lighting to the inner dome



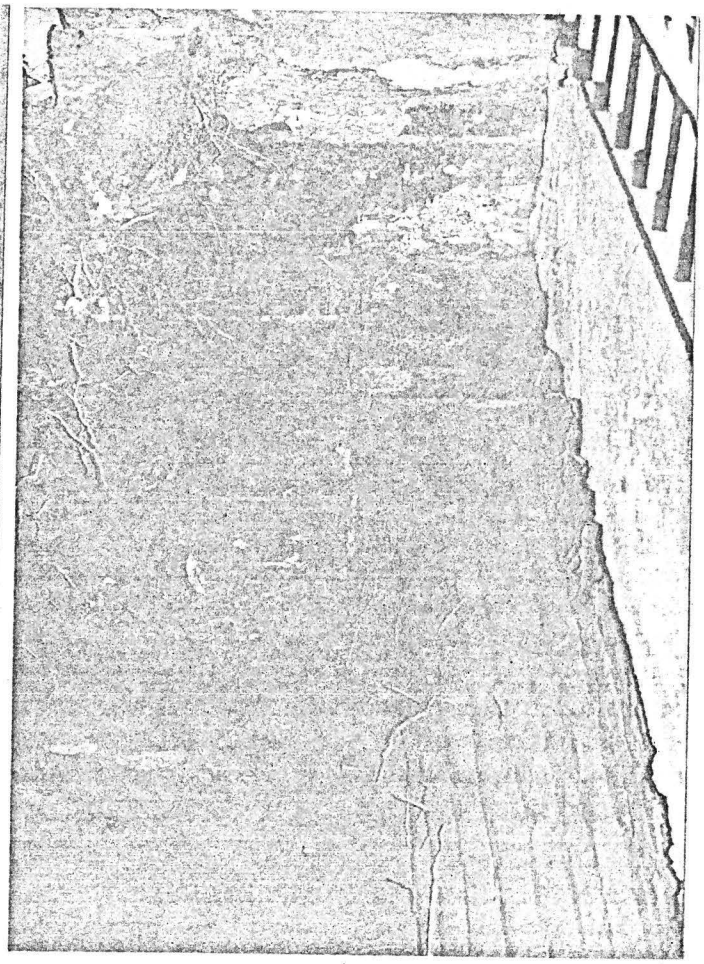
55. Borer beetle damage to stairway



56. Sag in roof near air conditioning unit looking South



57. Sag in roof near air conditioning unit looking N.



58. N.E. corner at intersection of the E. 1922 addition & 1845 building at center section

59. East footing of 1845 building

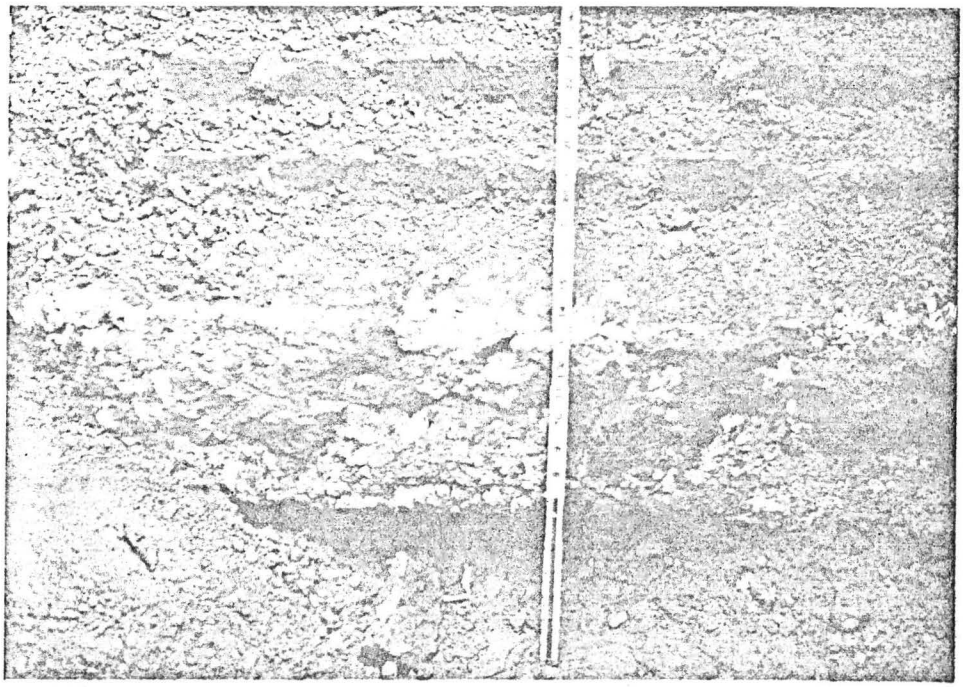
60. Intersection of footing of the East 1922 and 1845 building

61. Roof drain tile below grade with hole allowing water to keep footing wet

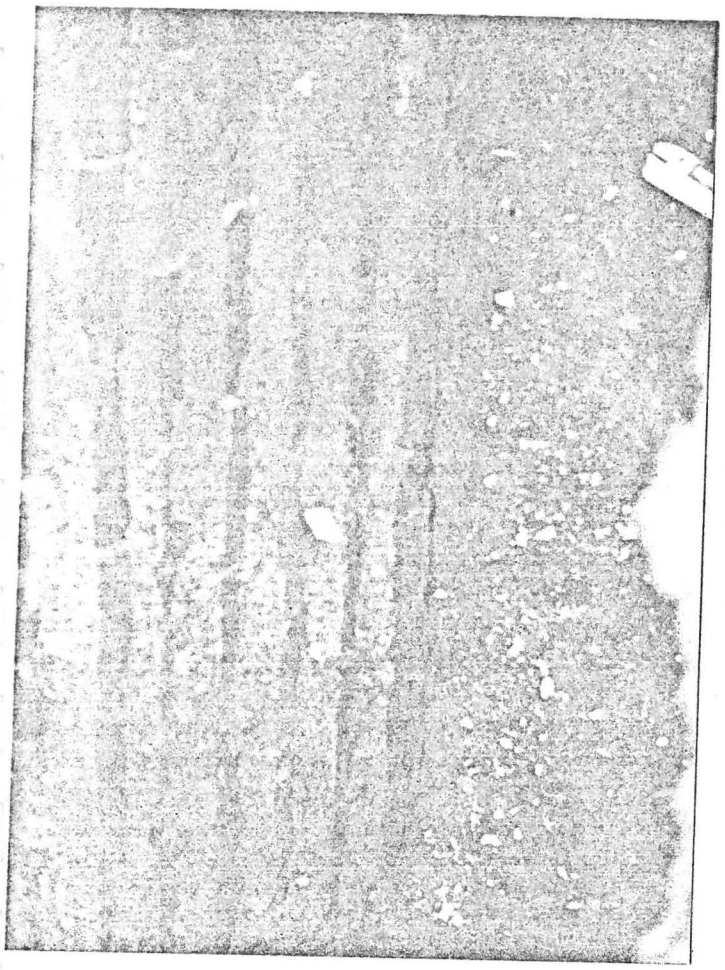
62. Intersection of 1902 addition and 1845 building @ N.E. Corner

63. Drain support @ N.E. corner intersection

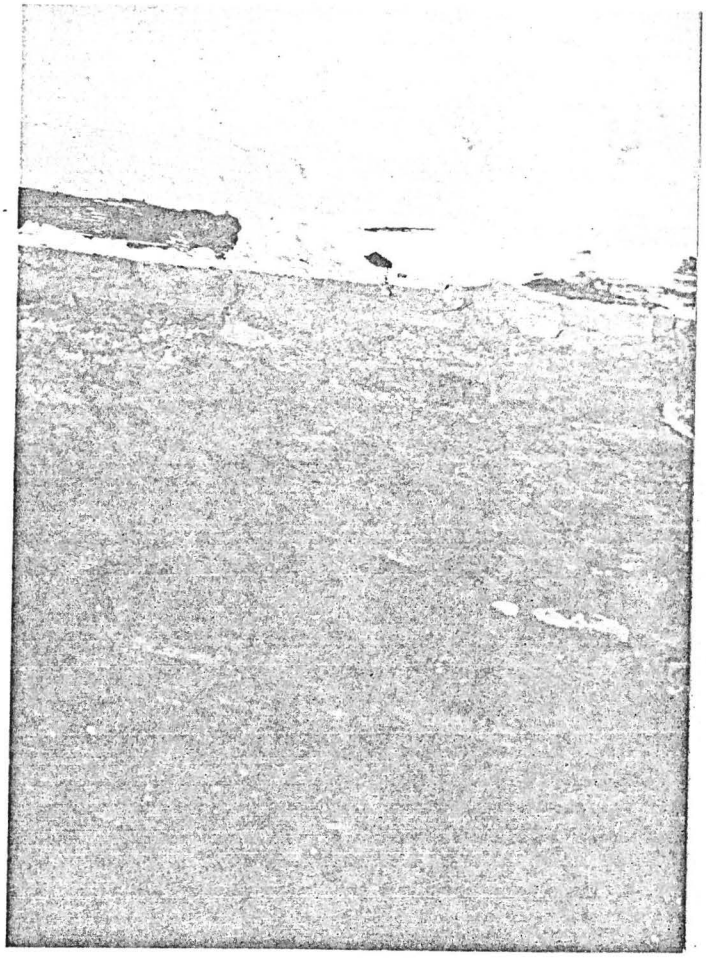
64. Footing of the West 1922 addition along the North Wall



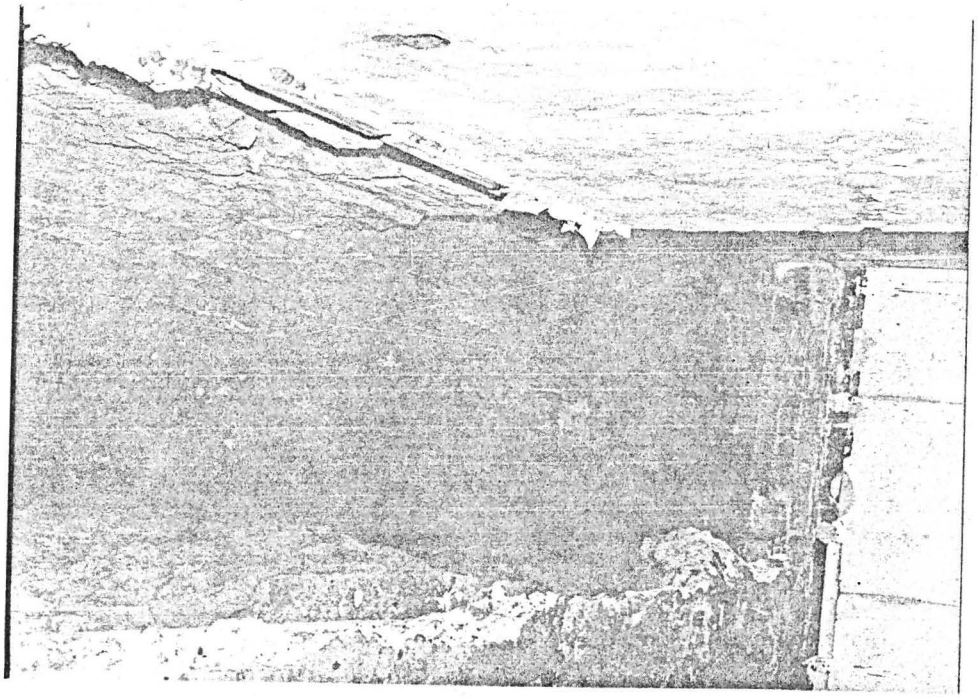
65. Concrete footing @ the West 1922 addition at North Wall Intersection



66. Typical footings of exterior wall on the inside of the 1845 building



67. N.E. chimney footing, north side carrying part of the dome load



68. N.E. chimney footing, South side